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THE

JOURNAL OF THE SOCIETY OF ARTS,

AND OF THE

INSTITUTIONS IN UNION.

VOLUME V.

FROM NOVEMBER 21, 1856, TO NOVEMBER 13, 1857.

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THE
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No. 209. FRIDAY, NOVEMBER 21, 1856. Vol. V.

Journal of the Society of Arts.

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FIRST ORDINARY MEETING.

WEDNESDAY, Nov. 19, 1856.

The First Ordinary Meeting of the One Hundred and Third Session was held on Wednesday, the 19th inst., Col. W. H. Sykes, F.R.S., Chairman of the Council, in the Chair.

The following Candidates were balloted for, and duly elected:—

Benham, Frederick.
Benham, John Lee.
Dudgeon, Patrick.
Hill, Rev. James, B.D.
Masterman, Wm. Stanley.
Shaw, Bentley.

The following Institution has been taken into Union since the last announcement:—

423. Black Dike Mills, Literary and Scientific Institution.

Colonel W. H. SYKES, F.R.S., as Chairman of the Council, delivered the following

ADDRESS.

I find that the Bye-laws of the Society of Arts, Manufactures, and Commerce demand from the Chairman of the Council of the Society an address upon the opening of the new session; and in execution of the duty required from me, I proceed cheerfully to attempt the task, regretting only that it has not fallen upon some other member, whose knowledge and experience in the working and objects of the Society would have made it more advantageous to the interests of the Society, and certainly more acceptable to its inaugural meeting. My duty, I believe, is less to give a retrospect of the work of the past year, than a foreshadowing, as it were, of our proposed operations and aspirations for the forthcoming session. Properly it is the duty of the Council in its Annual Report to review our byegone labours; nevertheless, the example of my predecessors in this chair will justify me, in case I find it desirable, momentarily to recall your attention to any subject already disposed of. And first, with respect to that which is of immediate interest to ourselves, in relation to the improved accommodation and comfort of our members. It will, no doubt, be in the recollection of very many members, that when it was necessary, ten years ago, to redecorate the Great Room, in which we are assembled, it was necessary to invite special subscriptions, and borrow on debenture £1,000, for the purposes of the Society. We have reason to congratulate ourselves on the contrast which our present position exhibits. It has not *now* been necessary to ask for subscriptions, or to borrow money for the costly work of redecoration and repairs. Our means have not only sufficed for these objects, but the promise of the Council in their last report has been fulfilled, and £500 of the debenture debt paid off. Increased accommodation will be afforded. By re-arrangement the Council propose to devote to the members three apartments on the ground-floor as reading and reception rooms and library. The treasures of the library, which have hitherto been less prominently before the Society, and have been less available than they deserved, as the volumes mostly contain records of important facts, will have such a disposition as to invite members to their profitable use. The inconveniences of last year, arising from defective lighting and ventilation, it is to be hoped are now obviated, and it will be patent to the members that the necessity for an improvement in the appearance of the Great Meeting Room has not escaped the attention of the Council. While on the subject of your present location and home, it is right to invite the members to a prudent forethought of their whereabouts hereafter. The Society of Arts and its domicile, which have become venerable together by near a century of association, are threatened with a rude disseverance by the termination of their legal tie to each other; in short, in ten years the Society's lease expires, and, considering the magnitude of the Society, the magnitude of its association, the scale of its exhibitions, and its past, and, it is to be hoped, increasing reputation, its *domus* or home should be in keeping not only with its present dignified position, but with its anticipated future development. Considering that that marvel of our times, the Great Exhibition of the Industry of all Nations, had its germ in the working of this Society, and that its successful results were chiefly owing to the personal interest taken in the Exhibition by our President, Prince Albert, and by the aid and advice of the Council and leading members of the Society—considering, I say, these facts, it appears to me that it would only have been in harmony with the common objects of the Exhibition and of the Society, that the Exhibition, from its accumulated wealth, should have testified to a grateful sense of its parentage by an assignment or contribution of funds for the erection of a domicile suitable to the Society's wants, upon the frieze of which the Prince would probably have desired to see inscribed—

Esto perpetua.

Such reasonable anticipations not having been realised, it is a matter for grave thought with the members of the Society to devise such means and take such early precautions as shall secure to the Society, when the period for the vacation of the present house arrives, a larger and better abode, and whose internal accommodation shall be better suited than the present to the wants of the Society, involved in which, it must be borne in mind, is space for the exhibition, and, indeed, permanent display, of specimens of the most recent improvements in the several departments of manufacturing industry, many of which prove their worth and practical usefulness by winning the Society's medals and prizes; but with the Society's present accommodation, the labours for the accumulation of objects are scarcely completed, than the pressure for the admission of the inventions of newer candidates for popular favour compels substitutions which destroy or disarrange the instructive sequence of the whole. A larger building than the present, with more accommodation, is, therefore, evidently necessary, and as houses already built are little likely to be adapted to the necessities of the Society, it might be right for the Society to inquire whether, in the vast area which the Government is about to clear in Westminster, a site might not be obtained from the Government upon which a building could be erected for the Society, to harmonise in architectural character with the blocks of buildings which it is understood the Government is about to erect. I have dwelt at some length upon this subject, for it is one, be assured, involving the future interests of the Society.

In proximate association with this subject of the House, is the immediate and pleasing duty which will devolve upon me, at the termination of the address, of distributing the medals and prizes adjudged by the Society during the last year. To offer any remarks upon the policy or public advantage of a usage which has characterised the Society from early times, and in which many thousands of pounds have been spent to reward the inventive faculties of praiseworthy and enviable individuals, and to stimulate by such examples the inventive faculties of others, would be to trifle unjustifiably with your time and attention; and, by an advocacy or an argument, would imply a doubt, which can have no existence in the mind of any one I have the honour to address. Assuredly great caution should be exercised in the adjudication of distinctions which give to the selected the advantages of public confidence and respect, to the possible detriment and damage of confiding individuals, and certainly to the discredit of the Society, in case the medals and prizes were adjudged upon insufficient ground, and more particularly in case the inventions themselves were destitute of a palpable practical character. I have every reason to believe, that the adjudications of the Society have been at all times regulated by the intrinsic merit of the inventions and the importance of their application, and to have been equally free from favour or affection.

To show the important nature of the inventions and subjects which have been under the review of the Society, is beyond my purpose, and it will suffice to enumerate those of the present year:—

Silver Medals.—To Messrs. J. Kenyon Blackwell, Humphrey Chamberlain, John Bailey Denton, William Felkin, Chandos Wren Hoskyns, for their Papers read at the Society's evening meetings.

A Silver Medal.—To Professor Clark, M.D., for his "Application of Lime to the Softening and Purifying of Water for the Supply of Towns."

A Silver Medal.—To Herr Paul Pretsch, for his "Application of Photography and the Electrotype to the Production of Engraved Copper Plates for Printing."

A Silver Medal.—To Mr. James King, for the "Importation of Wine, the Growth of Vineyards in New South Wales."

Special Prizes, of a Gold Medal.—To Mr. Charles Wye Williams, for his Essay "On the Smoke Nuisance;"

And of a Silver Medal.—To Mr. Charles Hood, F.R.S., for his Essay on the same subject.

But a special prize amongst the members demands a special notice. The Society's gold medal was adjudged to Mr. Charles Wye Williams, for his essay "On the Smoke Nuisance;" a nuisance which has been suffered so long to exist, equally to the discredit of the government and the people, since it has been known for years that it was remediable; a nuisance, also, which will not be wholly abolished, even with the aid of the recent Act of Parliament applicable to that object, unless vigilant attention be paid by the public of London to the constantly recurring infractions of the law; or the quiet and recurring neglect of the personal labours necessary to secure the efficient working of the smoke consuming furnaces. Every man who sees the chimney of a manufactory in London vomiting forth a cloud of unconsumed carbon, should, from a sense of duty to his fellow-citizens, unhesitatingly act the "informer," and denounce the offending chimney, with the satisfactory conviction that he is doing a public good. Indeed it might be matter for consideration whether systematic attempts might not be made to induce private families to adopt Dr. Arnott's smokeless fire grates, which it is understood is not only efficient but economical; it would save us from the alarms and dangers of "chimney a fire," and the gradual and certain destruction of our costly furniture and gilded decorations.

Continuing the subject of labour within our own walls, it may be as well to mention at this stage of my address, and before I proceed to external operations, that the Council has anxiously sought to provide profitable pabulum for the evening meetings of the Society during the ensuing session, and they are glad to announce that their valuable coadjutor Dr. Royle, has proposed a paper upon Indian fibres for cordage, clothing, and paper making material. Mr. Binks is good enough to contribute a paper on some new methods of dealing with linseed and other oils, in relation to their drying properties, for paints and varnishes; and he has promised another paper, at an early period after Christmas, upon some hitherto unrecognised phenomena occuring in the manufacture of steel and malleable iron, in which Bessemer's and the new Austrian steel process will come in for consideration and discussion. Mr. Fothergill Cooke is prepared to describe the Leicester Sewage works; and Professor Owen will favour us with one of his valuable and instructive contributions, the subject of which is the "Ivory and Teeth of Commerce."

These arrangements provide for the meetings of the Society up to Christmas; after which period hopes are entertained that the resources of our numerous Colonies may be illustrated. Mr. Temple, the Chief Justice of Honduras, has undertaken to favour us with a paper upon Honduras. It is reasonable to expect that the overtures which we have already made to form a Union of Colonial Institutions, in which we have been successful to the extent of ten Institutions, similar to our Home Unions, will insure us a cordial sympathy and aid from our associates abroad, which, we trust, we shall be enabled to reciprocate in a way to strengthen their interests and to invigorate their usefulness. It is unnecessary to enumerate here the terms and objects of these unions, as they are recorded at page 568, in the *Journal* of the Society.

The Society during the last year gave its attention to the present severe pressure upon Literary and Scientific Institutions, by rates and taxes; and, through the medium of its parliamentary friends, caused a bill to be introduced for the relief of Institutions. Although to some extent at first opposed by the government, the bill passed through some stages, but the session wore on, and the unusually early prorogation of Parliament left no time for its passing through the House of Lords; it was therefore dropped, but it will be re-introduced early next session, and carried through, it is to be hoped, to a successful result.

The present state of the Patent Law also has engaged the attention of the Council, and will continue to do so during the ensuing session. The subject is an intricate one, and considerable diversity of opinion appears to prevail upon its policy and bearing; but there is a community of opinion that in its present state the Practice and Procedure of the Patent Law requires amendment.

Judging from the reply of the present Lord Chancellor, given to Lord Harrowby, as representing the Committee of the British Association, there is no indisposition whatever on his part, as the Chief Commissioner of Patents, to adopt any well considered plans for amendment which may be urged upon him.

I would invite the attention of the Society to the remarkable fact that in this age, fertile in inventions and inquiry, the Council have deemed it right to publish a list of prizes for desiderata in improvements in inventions already existing, or for new inventions, or matters which our daily increasing wants call for. This list comprises no less than 216 subjects, and many of them are of the highest importance to almost every class engaged in manufactures, science, or commerce. If two or three of them are mentioned as typical of the whole, the practical good sense which dictated their selection, and the earnest desire of the Society to render their labours useful to the public, will, I trust, be manifest. For instance, a prize for the "*Best methods of distilling coal or bituminous substances, and utilizing the residuum.*" For "*The best means of preventing salt efflorescence in walls.*" For "*The best method of economically deodorizing sewage and other waters, or of precipitating or otherwise extracting the matter held by them in suspension.*" For "*An Essay on the management and maintenance of public roads, with special reference to their altered position since the introduction of railways.*" For "*An Essay on the various branches of industry which are known to be unhealthy, pointing out the causes of their injurious effects, with suggestions for prevention or relief.*" For "*The discovery of any simple and efficient apparatus for detecting and registering impure states of the atmosphere, either in mines or in overcrowded and ill-ventilated buildings.*" For "*A means suitable for office use of writing, copying, or producing a single or several copies of a document at one time by electricity or otherwise.*" For "*An Essay on the various concretes, cements, hydraulic mortars, and lutings for pipes, tanks, &c.*" Need I furnish further illustrations of the utilitarian spirit and benevolent views with which the subjects for the prizes are selected.

Commercial International Law, Tribunals of Commerce, Chambers of Commerce, Manufacturing industry, and the present state of commercial enterprise between Great Britain and other countries, would carry me into so wide a field of observation and remark, that I dare not trespass upon your patience to the extent these subjects would necessarily demand. I shall limit myself, therefore, to a hasty comment upon them. Commercial International Law has been taken up with very great interest by Professor Leone Levi; and, considering the gravity and importance of the subject, and the unquestionable public and universal advantage of common laws to regulate commercial intercourse between different countries, the Society would necessarily give its aid in furtherance of the attainment of so great a good. But the local characteristics of peoples; their laws, interwoven with their social institutions; and the prejudices arising from differences of race and language, present obstacles which seem to be insuperable. Man and his institutions, however, change with time; and a persevering and cautious pursuit of the object may in the end be successful.

On the subject of the establishment of Tribunals of Commerce, for arbitrations upon commercial questions, instead of having recourse to courts of law as at present, as such tribunals are found to be beneficial in foreign states, it would seem that they might be equally advantageous amongst ourselves; but, from some unexplained cause, although many great commercial names are associated with the undertaking, Tribunals of Commerce are still a desideratum.

Commerce is in fact the bartering the products and manufactures of one country with another; it grows or wanes, rises or falls, with the relations between supply and demand. The cost of production affects it; the inequality of reciprocal wants affects it; the indifference of manufactures to the tastes of their customers affects it. War did greatly affect it; but now, since the Peace of Paris, that neutral ships make neutral goods, war will be less injurious to commerce than heretofore. Arbitrary protective or heavy duties affect it; but it is to be hoped that the example of England, and the growing free trade spirit, which was so strongly manifested by the delegates of many nations recently at the Congress at Brussels, may ere long influence governments and cause commerce to be left to pursue her path unrestricted. Nevertheless, even when left to herself, between free countries, aberrations occur which gainsay the anticipations and predictions of political economists and the Nestors of commerce. When gold was found in such profusion in California, and subsequently in Australia, it was predicted that the former relations between gold and silver would be immediately and seriously affected, and that the prices of labour and commodities would greatly rise, from the abundance of gold. And what is the real state of these predictions? Neither the prices of labour nor of commodities have increased *pro rata;* but the price of gold itself has increased in foreign countries in consequence of the demand for it beyond the supply, originating in the perennial drain of silver from Europe, to liquidate the balance of trade in favour of China and India. In the month of January last, I read to the Statistical Society of London, a paper upon the "External Commerce of India with all the World." I showed from official statements, that there was an annually *increasing* net import of silver bullion into India, in consequence of the manufacturers of Europe not *increasing* the export of their manufactures to India in the same ratio as their *increasing* import of the products of India, and consequently the unusually increasing balance due to India was to be paid by *increasing* exports of silver bullion, the only receivable commodity in exchange; and I used these warning words: "It is of grave importance, therefore, to merchants trading with India, that they should have clear and comprehensive views of those normal conditions which indicate that their export trade in goods seems to have attained its maximum, while their import of Indian commodities has been annually increasing; and not less important is it, that the bullionists and bankers of England and of other countries should be constantly and fully alive to the exhaustive process of an Indian trade." I will not here repeat the tabulated facts communicated to the Statistical Society, but will limit myself to the statement that the unfavourable conditions of the commercial relations between India and England and China which I described in January last have been aggravated since that period. The average net amount of silver bullion imported into India from 1834-5 to 1841-2 was £1,858,000. The average had increased, from 1849-50 to 1853-54, to £3,799,900 sterling; but by the latest accounts it was more than six millions in 1854-55; and the export of silver from 4th January to 20th December, 1855, to China and India from England alone, was £6,409,889; and in the present year it is understood it will be eight millions sterling. It has always appeared to me that this drain of silver from England for the payment of the produce of India might be mitigated by the manufacturers of England and other countries adapting their manufactures exactly to the tastes of the people of India. Very little of the personal clothing of 150 millions of people in India is exported to India, and none of it in the form of fabrics in which the articles of clothing are worn—an omission which the manufacturers of England might surely supply; and as there will shortly be opened to the public a Trade Museum at the India House, of the raw and other products of India, it is to be hoped manufacturers may in time efficiently assist to diminish this existing difference in the exchange between the trade products of India and England, and that there may be a consequent diminishing drain of silver bullion in the adjustment of the balance of trade. I may add that from 1833-34 to 1854-55 inclusive, the three mints of India have coined into rupees £71,202,828 of silver bullion.

For above a century we have been designated the Society for the Encouragement of Arts, Manufactures, and Commerce; and, in a cursory glance at our designation, the consideration of the education of the people may not appear directly within the compass of our objects. Nevertheless, a moment's thought will bring to our minds the conviction, that the arts will be more practically useful, manufactures more economically organized, and commerce will be conducted with more permanently profitable results, if the minds of those engaged in these pursuits are suitably instructed, or, in other words, educated. But what is education? Does a little knowledge (for it is rarely a perfect knowledge) of writing, reading, arithmetic, and a religious catechism, constitute education?—acquirements which are mastered before a child is ten years of age. Where is the profit of writing, when there are few or no ideas to record;—what the advantage of reading, without thought;—what the capacity to master the multiplication table, without applying it; and what a fluent utterance of terms of faith, without probably the possession of a definite religious sentiment, and without a guarantee of conduct from the absence of moral convictions. And yet this defective state of instruction of the masses has long, and does still, characterise benevolent England, and is denominated education. Unhappily, our present jail returns disable us from questioning the reality of the picture thus darkly drawn. And what, in a country so wealthy, with so much of mental energy, so much of practical common sense, and so much of active benevolence as England is generally admitted to possess; what, I say, can be the solution of an apparent enigma in the will and the effort to educate the masses being hitherto abortive, or nearly so. Alas! a primary law of our nature, a ceaseless stimulant of action, and with the poor almost always resistless—selfishness—steps in to nullify and render fruitless equally the labours of love of the benevolent, the philosophic, and the religious, and the provisions of the legislature. The humble parents who are operatives, struggling with the difficulties of maintaining themselves and large families in the disproportion between wages and the cost of support, are impelled to withdraw their children from school at the very age and at that state of instruction when the mental faculties are being developed, when the little the children have learnt, could and would, if instruction were continued, be expanded into useful knowledge. At that critical moment the parents turn their children's labour to profitable account; they take them from school, usually at the age of ten, or even earlier, engage them in domestic offices, sell their services in the mill, or in agriculture, and for future mental culture the child and the man are left to the rough, and rarely moral or religious experiences of vulgar life. The little that was learned, the writing, reading, arithmetic, and catechism, the means to ends, are either forgotten or are in abeyance, and the future enjoyments are those of the senses—the animal prevails, the "Mens divina" is obscured.

It was the contemplation of this physical and mental condition of the operative classes that led the benevolent mind of Dr. Birkbeck to the consideration of the means of applying a remedy to the evil; or at least to offering the facilities to the willing of the operative classes for escape from the mental darkness in which they were enveloped into the bright light of a cultivated intellect. Hence originated the Mechanics' Institutions of Great Britain, chiefly from the co-operative labours of the operatives themselves. Their halls sprung up—their libraries became respectable; gratuitous lecturers gave their aid; and there was a reasonable prospect of the child's interrupted education being completed in the man by self-study. Objections there were to these Institutions. It was asserted, that it either made those who were ambitious smatterers in science and literature, self-sufficient, conceited, and discontented with their condition, or that they wasted their time, and excited morbid sympathies, by reading novels and works of fiction. There may be some truth in all these objections, but the history of the Institutions seems to indicate that the good they produced more than balanced the evil. Some who applied themselves gravely to physics and mathematics, have emerged from the operative condition into that of instructors and masters and men of wealth; and, in the ears of thousands, the facts, whether of nature or not, enunciated by the lecturer, must have, at times, occasioned either a profitable or a pleasurable reminiscence. But working men, in these Institutions, it is said, read novels! and why not? Most of the toil-worn operatives, at the close of their ten or twelve hours' labour, seek stimulus and recreation. The choice is between the gin-palace and pot-house and the library and lecture-room of the Mechanics' Institution. Better a draught of morbid sensibility than inebriating alcoholic drams or muddling pots of porter. Certainly the draught is less costly. But has not the operative the passions, perceptions, and susceptibilities of our common nature? Cannot his heart be moved, his joy excited, and his admiration stimulated by the incidents of ordinarily good novels?—at least, he sees pictures of the usages of society, marks the language of intercourse and the amenities of cultivated life—all which he cannot see in his own condition. Depend upon it, the roughness, the oaths, the coarse and rude phraseology, the animal enjoyment, the harsh treatment of his wife, which may have been his characteristics before, will be gradually softened, and may, in time, disappear. I do not, therefore, disapprove of the operative reading works of fiction, and I do not regret to see the proportion these works bear to other works withdrawn from the lending libraries of the kingdom.

It does not, however, necessarily follow, that the operative and agricultural peasant prefers works of fiction, that is to say, of amusement, rather than instruction with amusement. If I am to judge from the catalogue of a library of the Hants and Wilts Adult Education Society, an admirable association of 100 villages or more, which might be so profitably established in other parts of Great Britain, which has recently been kindly put into my hands, and in which the books chiefly used are marked in italics, I find that the "Arabian Nights," "Barnaby Rudge," by Dickens, "Last of the Barons," by Bulwer Lytton, "Bracebridge Hall," Edgeworth's Novels and Tales, "Confessions of a Lover," "Ivanhoe," "Jane Eyre," and many other novels, are less in request than Historical and Biographical works; particularly the lives of "Bonaparte," and "Duke of Marlborough," and "Sir Isaac Newton." "Chambers's Journal," and "Papers for the People," "Dickens's Household Words," "Half-hours with the best Authors," "The Penny and Saturday Magazines," "Layard's Nineveh," and "Tales and Stories from History," appear to be popular; while the graver subjects in request are: "Tracts," "The Pilgrim's Progress," "Useful Arts and Manufactories of Great Britain," "Social Evils and their Remedies," "Family Economist," "Cyclopedia of English Literature," "Conversation with a Father and his Children," "Defoe on the Plague," "The Letter Writer," and "The Races of Man." The popular works appear to be those of Scott, "Ten Thousand a Year," "Robinson Crusoe," "My Novel," by Bulwer, "Cottager of Glenbirnie," "The Old Oak Tree," "Uncle Tom's Cabin," and "Macaulay's Essays." There are no indications of much misspent time here; indeed the fact of communities of soldiers and sailors and agricultural labourers having amongst their popular readings, "Social Evils and their Remedies," "The Family Economist," "The Pilgrim's Progress," and "The Races of Man," may probably diminish the fears of the timid, with respect to the misapplication of book knowledge by the poor, and encourage the hopeful to look for the adult pupil becoming a better man and a better citizen.

But there is a large portion of the lower classes of the population which has not the advantages, such as they may be, of the operatives in towns; removed, like the former class, from school in childhood, from their dispersion over a considerable area, they have scarcely the means of association or combination for the erection of common halls, common libraries, and the insuring instruction from lecturers—I mean the agricultural labourers: Unlike the mechanic—from him the further means of mental instruction in manhood are nearly cut off. It may, indeed, be said by the poet, that

> "The field's his study; nature is his book;"

but I fear in the main his mental faculties are rarely sufficiently developed to enable him to reap much profit from the study of the fields or of nature. Beyond his wife and children, and the few of his own mental standard, the animals he tends are his associates, and he lives and dies almost debarred from intellectual development. The agricultural labourer, therefore, is peculiarly an object for the thought and consideration of the promoters of instruction amongst the poor. For him I see little help, except through village lending libraries, if established by the country gentleman, like those of the Hants and Wilts Adult Educational Society; but chiefly his help must come from the itinerant book hawkers, designated by the French "colporteurs," I presume from carrying their packs upon their necks or shoulders. The books so hawked must necessarily be very cheap to be within the reach of the agricultural labourer; and of what vital importance it is that the information they are capable of imparting should not only be useful, but harmless; while it is to be feared the present supplies by the hawkers stand in opposition to the latter category. Is it not an object, therefore, worthy of the Society of Arts, and in keeping with its other labours, to organize a system of supply to hawkers, of selected and cheaper books for the agricultural classes, for self-study and improvement, with the possible result of the Society finding itself applied to for examiners to grant certificates of intellectual competency to members of a class who have hitherto rarely aspired to any other distinction than that of being good farm-servants?

There cannot now, I think, be a doubt entertained of the advantage of the Mechanics' Institutions of Great Britain; but these advantages were susceptible of a further and practical development, and that, it appears to me, has been applied by the Society of Arts. Very many of the mechanics who read in the libraries or attended in the lecture-rooms, did so with a genuine desire for self-improvement, with a latent hope, possibly, of bettering their condition, but destitute of the chance of their useful acquirements becoming known to any parties, who might desire to use them. Many operatives, also, no doubt, would gladly tread in the same track, with a very slight stimulus applied to them, either to commend their labour or to move their pride. That stimulus, with great propriety, and, I trust, ultimate public advantage, the Society of Arts has applied, for the first time, in the last year, in the form of an invitation to members of Mechanics' Institutions to undergo examinations, by Examiners appointed by the Society, for the purpose of obtaining a certificate of their acquirements in branches of knowledge in which the mechanic himself might desire to be examined. With this certificate in his hand the operative could confidently offer himself for employment, and upon such certificate the employer could confidently take advantage of his services. I entertain sanguine expectations, that the prospect of obtaining such a certificate, which, in fact, will be a passport to service, will have an early and beneficial effect upon a considerable portion of the operatives who belong to Mechanics' Institutions; that there will be a new-born zeal for acquirement; that emulation may arise, and that the languor which threatened to pass into indifference may change into an active pursuit of those various branches of knowledge which the libraries and lectures are so capable of supplying.

As an additional incentive to the candidate for examination beyond the honourable certificate of competency which he might obtain, the Council have thought it desirable to institute money prizes; and many liberal members of the Society have come forward with contributions to form a prize fund, a list of whom will be read to the meeting, and further subscriptions are invited. To work out the examinations to their legitimate objects, the Council, through deputations, waited upon the heads of some of the Public Departments of the State, in the hope of one or more of the minor situations in a department being reserved as prizes for those candidates who had obtained the highest-class certificates. The late Mr. Wood, Chairman of the Board of Inland Revenue, was considerate enough to place at the disposal of the Council, as prizes, a couple of situations in his department. His unexpected decease has, however, deprived the Council of these rewards for competent candidates; but the Council will still indulge in the hope, that the heads of departments will not be wanting in the desire to aid in their laudable efforts to stimulate self-instruction in manhood.

The Society of Arts, at present, is necessitated to confine itself to two centres of examination, one in London, and one at Huddersfield. The Society is indebted to the gratuitous aid of many able and distinguished men for their services as examiners, and the establishment of more centres of examination at present would impose upon those benevolent gentlemen an amount of labour, and subject them to an extent of inconvenience which the Council of the Society could in no wise deem themselves justified in asking for. The time will come, it is to be hoped, when the funds of the Society may permit of the employment of gentlemen who will accept remuneration for their labour, and, at that period, the operatives can have local facilities for those examinations which the Council trust will give strength and permanency to Mechanics' Institutions, and make them auxiliary sources of supply of that practical intellect upon which the Arts, Manufactures, and Commerce of all nations must depend for success.

The Secretary then read the list of contributors to the fund for prizes to successful candidates at the Society's Examinations to be held in London and Huddersfield in June, 1857, as follows:—

	£	s.
The Society of Arts	105	0
Anonymous	10	0
Francis Bennoch, Esq.	10	10
Rev. Dr. Booth, F.R.S.	10	10
William Brown, Esq., M.P.	10	0
Thomas De la Rue, Esq.	10	10
Warren De la Rue, Esq., F.R.S.	10	10
C. Wentworth Dilke, Esq.	10	10
Peter Graham, Esq.	10	10
The Dean of Hereford	10	10
Henry Johnson, Esq.	90	0
J. Bennet Lawes, Esq., F.R.S.	10	10
The Master of the Mint	10	10
J. J. Mechi, Esq., Sheriff of London	10	10
Samuel Morley, Esq.	10	10
General Sir Chas. Pasley, K.C.B.	5	0
R. Stephenson, Esq., M.P., F.R.S.	10	10
Col. W. H. Sykes, F.R.S., Chairman of the Council	10	10
G. Fergusson Wilson, Esq., F.R.S.	10	10
Bennet Woodcroft, Esq.	5	5

The medals awarded at the close of the last Session were then presented.

The Secretary announced that at the meeting of Wednesday the 26th instant, the following paper would be read:—"On Indian Fibres," being a sequel to "Observations on Cordage, Clothing, and Paper Materials," by Dr. J. Forbes Royle. On this evening, J. Griffith Frith, Esq., will preside.

HONORARY LOCAL SECRETARY.

The following gentleman has been appointed Honorary Secretary for Mirfield and the neighbouring district:—

Charles Wheatley, Esq., Mirfield.

MEN AND MANUFACTURES.

By W. Bridges Adams.

I have carefully read Mr. Chadwick's address to the Philanthropic Society at Brussels, on the question of labour and machinery, and it seems to me that his political economy, though true as far as it goes, with respect to machinery bettering the condition of the workman, as well as general humanity, yet by no means takes in the whole scope of the question. It is rather a special pleading in favour of special Lancashire cotton-spinning, dating—so says Mr. Chadwick, from Mr. John Kennedy, and not from Arkwright—than a question how the cotton wants of the British Empire may be best supplied with the greatest happiness to the greatest number.

It is quite true that our first cotton came from India, ready webbed for making into garments, and that the labour of India being beaten by steam labour in England, the cotton was brought raw, spun and woven in Lancashire, and carried back in webs of long cloth and other, to undersell the native manufacturers in the Indian market. And Lancashire spinners and weavers, native and imported from Scotland and Ireland, did earn greatly increased wages during the period of European wars, and the English government took great pains to prevent the exportation of machinery, in order to keep other countries tributary and subsidiary to Great Britain. But their pains were unsuccessful, and cotton mills grew up in France and Spain, Germany, Italy, America, and elsewhere. In many of these countries people were willing to work for such small wages that the English manufacturer was cut out, and where the small rate of wages did not balance other disadvantages in machinery, or where, with equal machinery, as in the United States, wages were high, the governments of those countries eked the matter out with prohibitory duties.

Not wishing to battle this in the first instance by improved machinery, the English manufacturers sought to cut down wages, which would bear reduction. This not sufficing, the power-loom was brought in, and the Luddite riots and frame-breaking were a clear proof that the workpeople did undergo suffering for a time. They had been taught a trade which they could not change for another, and in their rude way they maintained a struggle for employment, by which must be understood wages and food. No special pleading can get rid of this broad fact, even though we know that the "greatest happiness" principle demanded the sacrifice of the minority to the majority. It was an evil to the sufferers, though a necessary evil.

In short, a great exotic business had been created in Lancashire, in which nominally free people became slaves of the mill, as much as black men were slaves of the sugar-cane. A giant capital had been put into machines and mills, and vested interests created, which constantly sought to import, and cheapen, and educate labour. And, though humane manufacturers existed, there were abundance also of hard taskmasters rising from the ranks, familiar with every screwing process, and not more humane than West India planters, whose commercial axiom was, "better to buy than breed." The Lancashire masters needed not to breed. That was done for them in Ireland and elsewhere, as well as by their own workpeople. But, wherever bred, there can be no doubt of one fact, that spinners and weavers were either born or bred a distinct class from the general mass of British people, who gained their living by athletic and open-air labour. They are lower in stature, paler in complexion, more delicate in nervous organisation. And, notwithstanding, they require more and more stimulating food than open air workers—probably for want of assimilating stimulus in the atmosphere in which they work. The atmosphere of the cotton-mill is far from being as pure as the open air, and it is essential to cotton manufacture, at least in the present state of our manufacturing knowledge, to work in a heated atmosphere. In short, to work a cotton-mill in Lancashire, which is a cold and moist climate, we must create a race and an artificial climate analogous to those of Eastern India. It is quite true that amongst the people of Great Britain and its immigrants, we have many people of this class, especially in Ireland—the thin-fingered class, adapted to artistical employments, but they do not belong to the soil or climate: they tend to disappear continually; their lives are shorter, and, as a matter of commercial economy, it is not desirable to "raise," as the Americans call it, a short-lived people. The capital invested to grow them up to twenty-one years of age is sunk for a shorter period of fructification, and consequently at a higher rate of interest. If we could only obtain our clothing by the process of keeping up an artificial weakly class, we might then come to study the question, whether natural materials are not best adapted to the country where they are produced, as furs at the North Pole, wool in the temperate climates, and cotton towards the Equator. But the manufacture of cotton clothing is not necessarily confined to Lancashire, any more than woollen clothing is confined to Yorkshire; and it seems reasonable that the manufacture should go where soil and climate are favourable; where the people are indigenous, and not exotics, and the material is produced and can be produced in any quantities. To bring cotton, raw, from America, work it up in Lancashire by exotic workmen, and sell it in India, is certainly a less economical process than to grow it in India, work it in India by natives, and consume it in India by the general population there and elsewhere.

Economically, Lancashire labours under a disadvantage as compared with India. Lancashire cannot grow cotton—India can, and, it is said, as fine as the American. Lancashire cannot grow men and women, for if she ceased to import them they would disappear in a few generations, *i.e.*, men and women fit for cotton working. India has grown this class of population for ages—they are indigenous, and will go on as long as the climate continues the same. Indigenous Indian workers are cheaper than exotic Lancashire workers, for they require less and cheaper food. The warmth produced by burning carbon in the lungs of the Lancashire exotic, exists abundantly in the Indian atmosphere. What advantage, therefore, is there in keeping up an exotic race of British subjects to spin and weave cotton in Lancashire, while indigenous British subjects to any amount exist in India, better fitted for the work, and who, by reason of the climate, can live on one-fourth the wages.

Mr. Chadwick asserts that "Lancashire has less to fear than ever from the low priced and unrestricted labour and long hours of the cotton manufacturers of other countries;" and that in Austria thirteen-and-a-half-hours does not get more produce turned off than ten-and-a-half hours in Manchester. Very possible. But I doubt the fact, with equal machinery in both cases. Long habit has made machine improvement in Lancashire a day-by-day process; and there is little doubt that it is to this fact of the indigenous skill of Lancashire in metal-working and machine inventing, that the advantages are owing rather than to the workers of the machines. Year by year, as profits get wire-drawn, so goes on invention to balance it, Lancashire excels India because she has machines and inventors as well as educated workmen. But if India had the machines and inventors, with the workers of the machines at one-fourth the wages of Lancashire, the freight from India would not be an impediment to prevent British subjects in India from beating British subjects in Lancashire out of the home market with cotton webs.

And this must eventually come to pass. The opening up the country by railways will stimulate the growth of cotton. The growth of cotton will in time lead to the import of machinery from Lancashire into the Nerbudda districts, where coal and iron abound, and where cotton also will abound. The machinery of cotton mills is precisely the kind of machinery which Indian handicraftsmen—sword-cutlers and others—will know how to repair; and by quicker or slower process cotton-spinners and weavers will decrease in Lancashire, and machine-makers will increase with indigenous energy, while in India cotton-spinners and weavers will grow and multiply. Production will thus be greatly increased and art lessened.

And the Indian staple of manhood and womanhood will not be deteriorated, but improved, by constant increase of better work. And Lancashire people, changing from the cotton mills to the forge and metal working, will betake themselves, the men to work and the women to the domestic cares of their families, with a much larger sphere of happiness than in the present processes, wherein men, women, and children work in the mill together, guiltless of all knowledge of the domestic arts, knowing nothing but how to spin and weave cotton, and in short times wearing ragged garments from absolute ignorance of the knowledge how to mend them.

And not the least amongst the advantages will be the increase in the numbers of a fine physical race of men, fitted to do battle for freedom, if need be, against the continental chattels of centralisation, a process that makes and protects grown children but not men. I like not the condition of humanity similar to that of elder Thebes, the glory of which rose and set with Epaminondas and Pelopedas. A central Solon, doing all things for his people, and leaving nothing to be done by themselves, would put them into the exact condition to be undone by a tyrant or a fool—a Nicholas or a Bomba. Municipality may induce much folly, much roguery; but wisdom and honesty may also exist in sample and in competition. But, alas, for the centralisation that can only set forth one example, and that a bad one.

Let us, however, have no misunderstanding. I do not wish or propose that our whole people should consist of fair-haired and blue-eyed giants. No truth is more certain than that all human beings are born with peculiar aptitudes, all useful if applied to fitting purposes, and sometimes very mischievous if misapplied. The brawny Saxon tills the ground, and drains the bog, and builds the house, the shop, and the steam-engine, and the road and railway; he makes the rough places smooth on the land, and furrows the tracks of ocean with his great broad business-like hand, that wields the spade, and the axe, and the hammer, and holds the tiller and wheel with a grip like that of a vice. But the more delicately organised Celt, with nerves like lute-strings and not like cart-ropes, gives us the poetry of life,—music, painting, sculpture, architecture, and the infinite variety of things cognate to them. Without the Saxon navvies, we might perchance *build* temples, but we should *dwell* in wigwams and bothies. Without the Celt, we should dwell in barns, guiltless of all art save that of the beaver-made construction. The Saxon element conquers and governs; the Celtic element adorns; and therefore is it that France, indigenously a Celt producing country, sometimes makes colonies with ornamental appliances but no substructure. Lacking the instincts of government to follow up the conquest of enthusiasm, there is no permanence, and therefore Canada and other colonies fall into English hands; and thus, if the genius of disorder for any length of time plunges France into trouble, her colony of Algiers, left to itself, may again become a nest of pirates and a pest to the Mediterranean, in which case it will have to be conquered and governed by England and her ocean police, and what can be made to grow out of it according to its natural capabilities will then be seen.

The union of Saxon and Celt, or other cognate races, with climate and soil superadded, makes Englishmen, probably as Rome of old was made by constant provincial aggregation and absorption. But this union will not make cotton spinners and weavers such as are desired by Lancashire mill-owners. Physical strength is clearly in small demand, else, why resort to shoals of women and children. Quiet, gentle, docile people, partaking more of the nature of women than of men, indisposed to riot or rebel, obedient as the machine to the hand of the engineer, soft and silky as the cotton they help to form into threads and webs, are the mill-owners' human staple.

We can, doubtless, produce and mould such people, and by following the farmers' examples, do it more effectually than has yet been done, by selecting the stock, instead of taking it at random. We might even do something to make them longer-lived, by expending more coal, and driving currents of warmed air through the mills, and taking thought for healthy dwellings for them when they leave the mill to sleep or eat. But in a Lancashire climate they must work in enclosure. God's own wind cannot play upon them, laden with all the health-giving influences of nature, and they will be etiolated and monotonous—they will not be a people of joyous temperament, finding pleasure in mere vitality, the mere act of living. The incessant drowsy hum of wheels will infallibly check exuberant impulses, will act as a "governor" on their nerves, till they become as a part of the machine they tend. They are artificial beings, and not humanity in its whole sense.

Mr. Chadwick says, "moral character and trustworthiness must now be sought to work valuable machines." Quite true; but a very low order of clock-work morals and regularity, compatible with "doing no wrong," and also compatible with the exercise of no virtue in the high sense. Morals, in mere abstract political economy, have reference chiefly to absence of waste and absence of thieving. A man in whose mind there never sprung up a single impulsive generous emotion, a mere dull duty grinder, to look upon whom is an opiate, reckons in mere politico-economical logic as highly as the man whose soul is cast in heroic mould.

It is still a world of strife; and in a wider political economy, the hero still counts for much. He is the assurer of the worker—the guarantee that the wealth of the worker shall not be taken away by fierce tribes of barbarians lurking in civilised garbs. He is the upholder of that freedom which alone induces profitable work, and the absence of which may account for the lessened result of overtime labour. The turn-outs and strikes, viewed from this aspect, are not altogether losses, but wholesome stimuli as well, and we can conceive a state of things in which docile people might be kept by shrewd, calculating (and not cruel) masters in a condition to give the maximum of production, without any exertion of energy tending to raise them from the ranks,—nominally free men, as the dog or cat is free, but under the necessity of seeking a master for daily rations, without any choice between one master and another, all in dead level, and a universal equality of rations. I should certainly not covet to be either master or man in such a community.

In a large political economy, then, the question must occur, as to what are, not merely the possible employments, but what are the best employments for a nation having regard to the attainment of a generally elevated manhood, and what are the trades which should be discountenanced. If it could be proved that any particular trade tended to make the particular employers wealthy, and to spread a damaging pauperism over the community, it would be quite as competent for the State to prohibit such trades, as it does the kidnapping of girls for infamous purposes. Without, therefore, disputing the advantages that have economically accrued to England by a long monopoly of the trade of spinning and weaving cotton, the question now is, whether it is worth while cultivating a mere competitive trade with low-priced labour, at the cost of breeding and increasing a race physically inferior in general humanity to what might be kept up by adhering to more indigenous employments, the more especially when we have in India men without limit, the natural growth of a soil and climate peculiarly adapted to the spinning and weaving of cotton; and the more especially, when all Lancashire may ultimately be employed in producing the machinery for cotton-spinning, just as Switzerland produces watches.

I am not proposing to pull down Lancashire cotton-mills, but simply pointing out that a time is nearer at hand than is generally supposed, when the exotic trade originally imported from India to Lancashire, and protected by circumstances for a long period of years, must, by force of natural circumstances, again return to India; and that, so far from this being a cause of regret, it should be a cause of rejoicing, for it will improve the general staple of humanity in England, and render every human body and mind therein the recipient of a larger amount of comfort and happiness. I should like to see the time when every man in England could be a soldier, perfect at all points—not necessarily a soldier, but practically able to be so if required, with a national motto, "*Nemo me impune lacessit*," and not the Scottish thistle, with the arrogant "Wha daur meiddle wi' me?" which almost seems a version of the Irish invitation, "Will any jantleman thrade upon me tail,"—but the wholesome blooming briar rose, beautiful to eye and nostril, yet drawing blood sharply from the rifling hand seeking rudely to rob its blossoms.

While writing the above, Mr. Chadwick's phrase, "It was an aphorism of the father of the cotton manufacture in England, Mr. John Kennedy, of Ardwick-hall, lately deceased," has been puzzling me, for I have always understood that there were two fathers: Arkwright, who invented the "throstle," and Crompton, who afterwards invented the "mule." There was a Mr. John Kennedy, a worthy, painstaking Scot, who wrote a book, after making a large fortune; and he states in that book, "I came from Scotland as a mechanic, barefoot, to *learn cotton spinning* in Manchester," or words to that effect, but I shall have the book shortly, and will quote more accurately.

Now, this Mr. John Kennedy was a manly-minded man, without vulgar pride, who was utterly above the meanness of seeking to appropriate other men's reputation. He possessed portraits of all the chiefs and leaders in cotton, and descanted on them from time to time without hinting at any peculiar merit in himself. Now, is this the same Mr. John Kennedy alluded to by Mr. Chadwick? If it be, this looseness of statement in a paper of statistics gives an apocryphal air to the whole. Perhaps Mr. Chadwick will give us a short biographical notice of the Mr. John Kennedy he alludes to, as a question of historical accuracy, to put his paper on a proper footing.

I shall be glad if the editor will forward a copy of this to the *Moniteur*, in which Mr. Chadwick's paper was published. It is a subject which can hardly be too much discussed, and the acute French intellect will readily understand that man in the abstract is not a mere politico-economical syllogism, to be reasoned upon after the farmer fashion, sacrificing all other ovine qualities to the one consideration of producing good mutton—or cotton.

THE WORKING CLASSES OF EUROPE.

As the pages of the *Journal* contained, some months since, an analysis of a volume on the condition of the Working Classes of Europe, published last year at Paris, by M. Le Play, Councillor of State, under the title of "*Les Ouvriers Europeens*," it may be interesting to the members to know a few particulars concerning the success of that publication, probably the most complete ever brought out on this branch of social economy so intimately connected with the advancement of manufacturing and commercial industry.

It is a fact not easily to be accounted for, that in England, where the importance of the subject is generally so well appreciated, M. Le Play's work has excited comparatively little attention. In France, the sale of the work has far exceeded the expectation of its author, and more than 200 copies have been disposed of in other continental countries, to say nothing of orders received from more distant parts of the world, whilst the bookseller, Mr. Jeffs, of Burlington-arcade, the appointed agent for this country, has scarcely an order to report.

To those persons who may have been rather deterred by the size of the volume than attracted by the typographical perfection with which it has been got up at the Imperial Printing Office, it may be useful to learn that an abridged resumée of M. Le Play's System of Research has just been published, in the form of an octavo pamphlet, by M. Augustin Cochin, the eminent French philanthropist.

In pursuance of a report drawn up by M. Dupin, the French Academy has awarded to M. Le Play the Montyon Prize for 1855, with an invitation to continue his statistical investigations; and in furtherance of these, a special society has just been formed, under Imperial sanction, of which M. Le Play himself has consented to become honorary secretary.

One of its purposes is to grant pecuniary rewards to persons in France and other countries, who may send in essays on the local condition of the working classes, framed in accordance with the directions contained in the Society's statutes. Of these, copies have been deposited for inspection at the offices of the Society of Arts, Adelphi, and of the Statistical Society, St. James's-square.

THE WELLINGTON MONUMENT IN GUILDHALL.

This monument has just been erected. The finishing touches, however, have not yet been given. It consists of a group of three colossal figures, representing the Duke between peace and war, and a relievo, introduced below, of the Battle of Waterloo. It contains about 20 tons of white Italian marble, and has been executed in two years, at a cost to the City of £5,000. Mr. Bell, from whose studio it proceeds, was on the Council of the Society of Arts during the two years prior to the Exhibition of 1851, when that scheme was agitating. At the request of the Society he also prepared its manuals of freehand outline, and he is now one of its Board of Examiners.

A NEW CYPHER.

The Secretary has received the following specimen of a cypher, invented by Mr. N. G. Wilkins, of 27, St. Peter's-road, Mile-end, who desires the opinion of those versed in such matters as to its merits:—

280 R 112 A 25 Y

The inventor states that the above is a short dissertation (about 100 words) on the subject of the cypher; that it was written in about ten minutes, and with the aid of the key may be translated in about six minutes, though he considers it impossible to decypher it without such assistance.

Home Correspondence.

BESSEMER IRON.

Sir,—When I wrote my remarks on the subject of the "Bessemer Process," which appeared in your Journal of the 31st ult., I thought I had expressed myself clearly, candidly, and temperately, but it appears your correspondent Mr. H. W. Reveley has strangely misunderstood me, and he does not hesitate to impute motives, both to myself and to manufacturers generally, which ought to be disclaimed as being unworthy of the present time.

I am sure it is not true, that either the leading practical men, or the manufacturers generally of this great country, which derives its foremost position from its zeal for improvements, both in the arts and sciences, have, as he asserts, "*a deep-rooted antipathy to all changes;*" nor is it correct that they are influenced by such unworthy motives as to combine to defeat any man's improvement, because such individual may have secured it to himself by patent; much less is it possible that the iron trade could abstain from adopting, even at a great cost, (however disposed to do so, as has been imputed to them,) any mode in making iron or steel which would produce a saving of 40s. per ton, as it was asserted by Mr. Bessemer would be the result of introducing his process. That which all manufacturers who know their business oppose, is the dictation of men who, being mere theorists and experimentalists, have the assurance to try to teach those whose whole attention has been directed to acquire a knowledge of their own business,—teachers whose confidence in assertion is greatly *pro rata* with their ignorance. Imagining themselves to have something new, and something excellent, but very partially understanding the true nature of what they may be dealing with, they jump to conclusions which the more experienced readily see to be erroneous; and, prompted by men more ignorant than themselves, they do not hesitate to condemn those of whose judgment and knowledge their own is but a bare reflex at the best, and generally so imperfect as only to distort, nay, not unfrequently to imperil, the truth.

My friend Mr. Hall, whose B.B.H. iron is known everywhere as superior, and whose make cannot be less than 1,000 tons per week, has offered to give a large sum for Mr. Bessemer to distribute among the public charities, if he will either excel him in *quality* or *economy*, and has also offered every facility for Mr. Bessemer to apply his process at the Bloomfield works, a challenge as fair as Mr. Reveley could desire; but a life-time of experience has already shown Mr. Hall all that Mr. Bessemer has done, and much more than he has yet produced.

Away, then, with the notion that the ironmasters are unwilling to adopt improvements; nay, it is essential to their existence to encourage them; and the fact that so many came from all parts to see, at Baxter-house, Mr. Bessemer's experiments, proves how ready they are to examine every attempt towards improvement, but which is (in this quarter at least) yet to come, as I said in my last, "from something still unspecified."

Having satisfied Mr. Reveley, I trust, on this head, I will now simply again put forward Mr. Bessemer's proposal as it was given to me:—"That his process was to make malleable iron of pure quality direct from the pig, *was to save the forge process*, by enabling the manufacturer to roll the ingot or product of his furnace at once into the bar, or rail, or plate, as required." Thus, a saving of 40s. per ton was to be achieved, and not only so, but the quality was to be more equal and pure than is attained by any mode of operation previously known or at present practised.

By putting aside the whole forge process, viz., the necessary fuel and use of the puddling furnace, the shingling, rolling in the forge, and piling for the mill, no doubt such saving would accrue; therefore, any such proposition could not possibly be overlooked by the trade, as every individual interest would be involved, and necessitate its universal adoption, if only once introduced. But none of these, however, have yet been set aside, as insuperable objections are discovered and noted by the ironmasters in the proposed plan; indeed, on examination, it will prove to be more uncertain and more expensive than the method in common use.

Mr. Bessemer has done nothing more than is the result of Mr. Martien's patent, and it is questionable whether the process of the latter can be used with advantage; while it is less pretentious, as it does not attempt to do away with the forge process, but only to purify and economise in a moderate degree.

I could give a full detail of the ordinary process of manufacture, and point out where the difficulties of these inventions must arise, but it would be too extended for a mere letter, as it would embrace so many points of interest, that, to do it justice, it should rather take the form of a paper for your Society, than appear among your correspondence.

I am, &c.,

THOMAS M. GLADSTONE.

11, Austin Friars, Nov. 11, 1856.

WROUGHT IRON.

Sir,—The various processes now under discussion for the conversion of crude cast iron, are all, without exception, a revival of the Catalan forge under different circumstances and adaptations, and it may not be perhaps without its use to give a short account of that ancient and still practised method of producing bar iron, as well as to show at the same time the identity of the processes both old and new.

The Catalan forge is merely a common smith's hearth on a very extensive scale, furnished with a powerful water-blast of not much less than 14 lbs. to the inch. The blast is produced by two or more old-fashioned blowing trunks, simply set in action by a fall of water from 20 to 30 feet in height. The hearth of the forge is very long, with a pool or basin immediately under the blast, and the tuyère, or nozzle, points downwards to the centre of the basin, at an angle of about 45°.

A large quantity of chesnut wood charcoal is piled upon the hearth from end to end, and supposing the fuel ignited, the ore, as it comes from the mine, about three or four bushels at a time, is thrown on at the further end, in order to be gradually roasted as it is slowly stirred onwards to the more heated portion of the fuel, where it ultimately falls into the basin in the form of fluid cast-iron. After the lapse of ten or fifteen minutes, occupied by the fireman in stirring the melted mass with a long iron bar, it becomes converted, by the combination of an intense hollow fire with the powerful water-blast, into a rough ingot or ball of malleable iron, which is hooked out and slipped under the water hammer, where it is drawn into commercial bar iron. No flux whatever is used with the ore, but water is abundantly sprinkled over the outside of the burning mass of fuel in order to prevent useless combustion and concentrate the heat where most wanted. For finer descriptions of bar, the first make is faggoted as usual, and again drawn out until it has acquired its ultimate state of toughness and tenacity. Who cannot see the identity of the action of the Catalan forge with the puddling and finery processes, as well as with those of Bessemer and Martien? In the old method the smelting, puddling, and finery operations are all performed at one and the same time, as well as continuously, as fresh ore and fuel are added as fast as they are removed or consumed, so as to lose neither time nor heat; and though the operations may appear to be on a small scale, as they are continued day and night without cessation, the produce is large, and direct from the ore without further manipulation.

In Bessemer's and Martien's processes, the blast is upwards; in the Catalan forge, downwards; but the result is the same, for the water blast is sufficiently powerful to penetrate the melted and well-stirred mass, and to convert it from crude cast-iron into malleable bar.

I am not prepared to speak as to the relative economy of the Catalan process, but may observe that it requires a very small capital to set up, beyond the necessary water power.

In regard to the properties of the water blast, I can state from the experience I have had of two high smelting furnaces in the same works, and under similar circumstances, with the exception of one being worked by the water blast, while the other was supplied with the dry blast from an engine, that when malleable iron was required, the pig from the water blast was infinitely superior to that produced by the dry blast, and that when fine soft pig for casting was wanted, the latter had greatly the advantage, but no sharp castings can be made from charcoal furnaces.

The position of the tuyères has also great influence on the quality of the pig. When they are inclined downwards towards the centre of the hearth, as in the Catalan forge and water-blast high smelting furnaces, white hard pig is produced, but when they are horizontal, soft grey pig is the result.—I am, &c.,

HENRY W. REVELEY.

Poole, Dorset, Nov. 10, 1856.

AMPHIBIOUS CARRIAGES.

Sir,—Mr. Bourne having applied to me for drawings of Sir Samuel Bentham's amphibious carriages, my attention has been drawn to the navigation of the smaller rivers of India, and I herewith trouble you with a copy of my letter to him. I had also informed him that Sir Samuel had found no difficulty in steering the jointed vessels he invented.

"A principal objection to the navigation of the lesser rivers of India, is that they are liable to have their course obstructed by rocks and rapids. It has, therefore, occurred to me that this difficulty might be obviated by constructing a short railroad at such places to convey the boats themselves, without unloading them, and resuming navigation when the rocks and rapids should be passed. It would be easy to keep a supply of wheels at each station, so that the navigable vessels should not be encumbered by them, and the wheels might speedily be attached, as was proved in the instance of Sir Samuel Bentham's amphibious carriage. No engineering difficulty or costly works would be required for a kind of dock at each station, where the boats might be hauled on to the rail. In some cases the force of gravitation might be made available by the descending boat and cargo drawing up the ascending one."

I am, &c., M. S. BENTHAM.

26, Wilton-place, 10th November.

STENOGRAPHIC MACHINE.

Sir,—As I am not aware that any stenographic or shorthand machine has ever been constructed or invented, the following description of such an effort may not be uninteresting as a preliminary to a fuller development of the contrivance. The most essential conditions for such a machine, are quickness and precision; so that the slowest as well as quickest speakers shall have, not only their speech, but their idiomatic peculiarities and manner of delivery clearly represented, as nearly as art can do it.

A stenographic letter or type machine will never accomplish this, being of a mechanical nature, and not possessing the expression of sound, if I may so say, in its arrangement. I constructed two different machines on this principle some months ago—and although considerable dexterity could be acquired in their manipulation, I did not think the plans good enough for further prosecution. I therefore reflected on the suggestion, that all speech is the result of motional arrangement—chiefly of the tongue and lips; and that the articulation of different words required a corresponding change in muscular motion. I naturally concluded, if access could be obtained to these speech-producing motions, they could, by mechanical means, be transferred to paper. This transfer I partly effected in the following rough way:—I got four pieces of plane-tree, one for the chin, one for each lip, and one for the tongue. Each of these pieces I had thinly cut and formed to suit their respective places. That for the tongue was, as I foresaw, most difficult to arrange; however, I did arrange it so as to produce motion, though imperfectly. To each of these pieces I had a thin piece of slightly elastic thread passing round the head, to keep them in position when acted on by the organs of speech. To each of these pieces I had jointed four other long pieces of about eight inches respectively, and not quite so thick as an ordinary penholder. That, of course, for the tongue at its extremity, was made much thinner, so as to work with as little obstruction as possible. About half-way, or at the distance of four inches from the mouth, these small rods passed or worked freely through jointed sockets, fixed in suitable bearings, and connected at their ends to the ends of four other longer rods, of about eighteen inches in length, and placed at right angles to the smaller set, the ends of each being connected by joints. These joints are loose. At the distance of fifteen inches from these joints are four universals, fastened in proper frame work, in which these longer rods are securely fixed. To the unattached ends of these latter rods are the four pointers or tracers, which trace the motions made in the articulation of speech.

It may here be observed, that none of these natural motions are straight, but each word forms a combination of curves, proportioned in their size to the vehemence or lowness with which the words are uttered.

The tracers are placed in sockets, to which are attached small helical springs; from each of these tracers is a small wire, fastened to a string, by which the speaker lifts the pencils from the paper at the termination of each word or syllable.

The pointers must have small adjusting springs to keep them in position, before and after using. The head is to be kept steady in speaking, so as to give regularity to the written or traced lines. The method of trial which I adopted was extremely simple—consisting of two slides or guides for the carriage, on which was fastened the tracing paper—a long screw, a spur wheel, catch and handle. At each word or syllable I moved a tooth. And although the motions were not well defined, from the loose construction of the machine, they were sufficiently satisfactory to establish a belief, that if a machine were perfectly constructed, and regularity given to the motion of the carriage by further mechanical arrangement, the pointers being so adjusted as to give clear room for the movements of each tracer, so that they need not be lifted until the completion of each word, or not at all, it would give not only the time taken in uttering a speech, but also the time and nature of accent on each word or sentence. The practised ear, by means of the *stethoscope*, can readily detect the unhealthy affections of the lungs; so I think as readily may the practised eye detect the peculiarities of words and speech (to coin a word) by means of the *vocalagraph*.

The chief difficulty will be in obtaining correctly the motions of the tongue. To obtain them correctly may be an insuperable difficulty—yet they may be obtained with sufficient accuracy to give a varied form to the expression of each word, which is all that can be required. If one linguadental tracer be not sufficient for the purpose, one or two others might be added, with small horizontal pieces attached for the tongue. The larynx, vocal chords, and guttural and nasal sounds I have not considered, as I think they will be found more useful in the modulation of tone, than in the formation of speech. Walker, in his "Observations on the Greek and Latin Accent," says, "But till the human voice, which is the same in all ages and nations, is more studied and better understood, and till a *notation of speaking sounds is adopted*, I despair of conveying my ideas of this subject with sufficient clearness." He afterwards expresses his conviction that the ancients had a notation of speaking sounds, and states that he had formed one for himself, and that he hopes some one will be able to unravel this mystery in letters, which has long been the *approbrium et crux grammaticorum*, the reproach and torment of grammarians.

I am yours, &c.,
THOMAS ALMGILL.

Manchester, Nov. 17, 1856.

INDESTRUCTIBLE NATURE OF FERNS.

Sir,—Ferns are said to withstand the effects of even a very prolonged immersion in water, with scarcely any change, whilst not only the soft tissue of plants, but the heart wood of trees, decays so completely under the same circumstances, as to leave little or no traces of their character.* Have any experiments been made to turn to account the above cited property of Ferns, whether for admixture with water cements, formation of durable cordage or tissues, and with what practical results?

Information on this subject will oblige, Sir, yours, &c.,
GEORGE TWEMLOW,
Colonel Royal Artillery.

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* Vegetable Physiology and Botany, p. 29.

EXAMINATIONS.

Sir,—It was with a feeling of considerable regret that I read in the Society's *Journal* of last week that no certificated schoolmaster would, henceforth, be permitted to attend the Society's examinations.

No doubt the Council had weighty reasons for coming to such a decision, but I would beg permission, nevertheless, to point out a reason why I think it would be productive of good if they were to waive that decision with regard to *one* particular subject of examination. The subject I allude to is *chemistry*.

It may be the opinion of the Council of the Society of Arts, that as the Committee of Privy Council on Education hold *special* examinations for masters in this subject, there would be less excuse for admitting them to the chemistry paper than for other subjects not recognised by the Committee of Council. And so indeed there would, if certificated schoolmasters, who have worked up this extra subject, could present themselves at the Government examination in chemistry at their own pleasure; but this is very far from being the case. No certificated schoolmaster in charge of a school can present himself at such examination without *the consent and recommendation of a majority of the committee of his school.* "But surely," you will say, "there can be no difficulty in obtaining that." How many masters would rejoice with me if it were so! But so averse are the majority of school managers to the introduction of anything like *experimental* science into National Schools, that there is scarcely one school in a dozen where the master would be allowed to attend the examination, which, if successfully passed, would qualify him for the use of apparatus, a grant of which would be made *to the school* on his account at one-third the cost.

In a large school, of which I was master two years back, I not only offered to attend the examination, but actually offered one-half the money towards purchasing the apparatus, so that the managers would have had to pay but one-sixth of the cost, and even then I was refused permission to attend. I have, also, frequently met with masters in the same, and even worse circumstances. Only a fortnight back I was assured by a friend that he had offered to attend the examination and to pay the *whole* of the managers' one-third for the purchase of the apparatus—which would still have belonged to the school and not to himself—but so *wisely* were they convinced that it was not good for boys to be educated by means of which they had neither the time nor perhaps the capacity to learn the value, that they refused his request though the apparatus should cost them nothing.

Such instances as these being the rule and not the exception, I trust the Council will consider them a strong plea for waiving the exclusion of certificated schoolmasters from their examination in chemistry, or at least all those who cannot attend the government examination. Those who have *passed* the government examination in chemistry will scarcely wish to be examined, but the Council of the Society of Arts will be doing a friendly office for others, as it has already done for me, by putting "its stamp" upon the knowledge of those who—having obtained it—have been refused permission not only to apply it, but to have it legitimately acknowledged.

I should feel greatly obliged by your laying this before the Council.

I am, &c.,

JOHN JONES.

London-road, Reigate, Nov. 1st, 1856.

Proceedings of Institutions.

Bolton.—The Committee, in presenting the Thirty-first Annual Report of the Mechanics' Institution, regret that during the latter half of the past year the support accorded to the Institution has been such as to contrast unfavourably with that which it received in the preceding portion. The number of general members entered, which was for the first quarter of the past year 373, has only amounted in the last quarter to 207. Notwithstanding this, however, there is on the whole year a decided increase over the year preceding. The number of Honorary Members subscribing during the past year has amounted to 92; and the number of general members entered has been an average of 294 in each quarter. The number admitted by transferable cards has been 60, making an average total of 440. Compared with the previous year there has been an increase of 31 honorary members, 101 general members, and of 16 in the number admitted by transferable cards, or a total increase of 148. From the financial statement it appears that there has this year been an addition of upwards of £35 to the debt existing at the close of last year. On the whole, however, the Committee do not think there is much reason to despond, or to fear that the Institution will not recover from its present partial depression. The Library has this year received considerable additions, both by purchase and by donations. The total number of volumes purchased during the year has been 143. Seventy-five volumes have also been added by donation. The number of volumes now in the Library is 4,504. In the deliveries there has been an increase of 1,292 over those of the year preceding. The Classes in operation during the year, with the average number of members, have been as follows:—Writing and Arithmetic, junior section, 66 members; Writing and Arithmetic, senior section, 32 members; Mechanical Drawing, 22 members; Landscape Drawing, 9 members; French Language, 10 members; Reading and Elocution, 14 members; Chemistry, 12 members; Mutual Improvement, 13 members; Essay and Discussion, 36 members. Total, 214; or an increase of 88 over the number attending in the previous year. Two lectures have this year been delivered in the Reading-room; the first by the Rev. Richard Boyle, on Shakspeare's "Merchant of Venice;" the other, on the "Study of the French Language," by M. A. Podevin, teacher of the French Class at the Institution.

Brigg.—On Monday, the 6th inst., the tenth annual general meeting of the members of the Reading Society was held in their reading-room, W. Brocklesby, Esq., in the chair. The report of the committee for the past year, which was read by the secretary, showed that the Society continues in a very prosperous condition, having at the present time, besides honorary members, 203 proprietary members, whose subscriptions for the past year amounted to £100 12s. 6d.; that the library now contains 922 volumes, of which 92 have been added during the year; that 13,040 entries were made in the librarian's register of the circulation of books, periodicals, and newspapers, between the 31st August, 1855, and the 1st September, 1856, being an excess of 2,710 entries over any previous year. The treasurer's statement showed a balance in the Society's favour of £22 5s. 3¼d. The following gentlemen were appointed as the committee for the ensuing year, viz., John Hett, Esq., president; John Danber, Esq., vice-president; Mr. John Hewson, treasurer; Messrs. S. Upton and J. Parker, secretaries; and Messrs. W. Brocklesby, Thos. Freer, W. Nicholson, J. B. Moxon, Wm. Hart, H. T. Jackson, J. Lofley, G. Lofley, and Thos. Mason. The propriety of establishing classes in drawing and other important branches of knowledge, for the benefit of the junior members, and with a view to enable this Society further to participate in the advantages of union with the Society of Arts, was considered, and the committee for the ensuing year were requested to take all necessary steps for instituting such classes as early as it can be found practicable to do so. The sum of £10 out of the balance in the treasurer's hands was directed to be expended in the purchase of a further supply of new books. Votes of thanks were given to the officers of the past year, and after the transaction of other general business, the members separated, well satisfied with the success which has continued to attend the operations of the Society.

CHELTENHAM.—Courses of lectures have been commenced, and are fully attended, both at the Literary and Philosophical Institutions and the Athenæum. Among the lecturers engaged are Dr. Lankester, the Rev. H. Christmas, F. R. Bennett, Esq., P. L. Simmonds, Esq., and Mr. Balfour; and gratuitous lectures have also been delivered by Dr. Humphreys, of the Grammar School, and other friends of educational progress.

HUNTINGDON.—A meeting took place at the Literary and Scientific Institution on Friday evening, the 7th inst., for the purpose of elucidating some views tending to advance the education and instruction of the young men of the town in the useful sciences, in order to qualify them to become candidates for the prizes offered by the Society of Arts. The chair was taken by Michael Foster, Esq., the president, who stated the advantages which were likely to arise to those who would systematically undertake the studies which would enable them to put themselves in competition with those who were desirous to obtain appointments to public situations. He remarked that the system of obtaining places by patronage was now happily on the decrease, and it was by talent alone that for the future men could hope to attain to official situations; the East India Company, amongst others, had thrown their immense patronage open to public competition, and almost one of their first appointments, under the new system, worth £1,200 a year, had been given to the son of a tradesman of Royston. He saw no reason why the young men of Huntingdon should not make the attempt to obtain some of the prizes, which were within the reach of all who had talent and energy to qualify themselves for the ordeal. Mr. Honey, of Cowper's House Academy, explained at length the various branches of study in which young men would have to be examined—such as chemistry, mathematics, natural philosophy, and other sciences, for which the Society of Arts offered prizes varying from £25 to £10, besides giving certificates, which carried with them a recommendation to almost any situation for which the holder might become a candidate. For himself, he was ready on the formation of the classes to give instruction in any branch which came within his power; and he would say further, that where he was not himself competent, he would undertake to find masters at his own expense. He urged the young men to lose no time in taking advantage of the boon now offered to them.—The Rev. R. C. Black thought the scheme deserved encouragement; it was too often the case that when youths left school they thought their education was finished; whereas they had in fact only laid the foundation for that more serious study which was to aid them if they desired to attain distinction in after life.—The Rev. V. H. Millard spoke of the great advantage which the plan held out to young men with any pretensions to ability and perseverance. Some of the most eminent men of the present day had risen from the lower classes, by that systematic attention to any particular study for which their minds seemed to be designed. He instanced Sir Joseph Paxton, who was originally only a labouring lad in the Duke of Devonshire's garden; the late Hugh Miller, the geologist, who for many years worked in a quarry, and obtained his first insight into the depths of that science from the circumstance of being so placed; but then, when the talent in either case displayed itself, these men read and thought and worked hard to attain the proficiency which they subsequently enjoyed. And so it must be with all who desired to excel. They must *educate* the particular talent with which they were blessed; the muscular arm of the brawny smith could never wield the sledge hammer, if it were not trained to the occupation; and what that training was to the arm, education was to the mind; it formed it, strengthened it, and enabled it to overcome all difficulties that stood in the way of its advancement. The Society of Arts, desirous to promote the education of the people, had instituted these prizes, that there might be some incentive to study, and he saw no reason why some of those he saw around him should not participate in them, if with a vigorous determination they set themselves to work to do so.—Some other gentlemen briefly addressed the meeting, and thanks having been voted to the chairman, the meeting broke up.

MASHAM.—The inauguration of the new building to be called the Riddell Memorial Mechanics' Institute, took place on Monday, the 3rd inst. It contains a well proportioned class-room, a library and reading-room, besides a large vestibule, staircase, kitchen, &c., and a lecture-room, forty feet by twenty feet, with an elegantly designed roof and pannelled ceiling, a committee-room, an ante-room, a room intended for a museum, &c. The style is plain Italian, and presents three elevations, that in the centre with a southern aspect being very handsome. The chair was taken by J. Fisher, Esq., who, after having opened the business of the meeting, read the report of the building committee, which congratulates the subscribers on the successful accomplishment of their undertaking, in the completion of the very handsome building in which they were assembled, for the purpose of inaugurating it as a memorial to the memory of their much esteemed vicar, the late Rev. Thomas Riddell, who, for a period of nearly 15 years, had endeared himself to those committed to his charge by his exemplary and pious life. Soon after his sudden and melancholy death, a strong desire was expressed by many of his parishioners and friends to pay some mark of respect to his memory, and at the same time to preserve and hand down to posterity some lasting and useful record of him and his connection with the parish. As he had in his lifetime taken a very lively interest in this Institute from its first establishment until his death, it was determined to erect to his memory a handsome bulding in Masham for a Mechanics' Institute, to be called "The Riddell Memorial Mechanics' Institute." The Master and Fellows of Trinity College, Cambridge, granted the site, and gave a donation of £20 towards the building fund. A subscription was set on foot for the erection of the building, and in a short time it amounted to the sum of £461. The ladies of Masham formed themselves into a committee and got up a fancy fair and bazaar in aid of the building fund. This was held, by the kind permission of Admiral and Mrs. Danby Vernon Harcourt, in Swinton Park, on the 9th of July last, and realised the sum of £275, which, with the £461 raised by subscription, made the sum of £736 applicable to the erection of the building. In addition to this it should be mentioned, that many of the neighbouring farmers gratuitously led a great portion of the materials for the building. The funds having been thus raised, Messrs. Perkin and Backhouse, architects, of Leeds, kindly volunteered to present the committee with the design of the present edifice. The first stone was laid on the 15th of March last, by Admiral Harcourt, of Swinton-park, in the presence of Timothy Hutton, Esq., of Clifton Castle, the Rev. Thos. Hedley, M.A., Vicar of Masham, William Perkin, Esq. (the architect), the officers and committee of the Institute, and a large concourse of the inhabitants of Masham and its neighbourhood. The Rev. Canon TREVOR, of York, in an address of some length, moved the adoption of the report, which was seconded by the Rev. Thos. Hedley, Vicar of Masham; the Rev. Dr. Whiteside, Vicar of Scarborongh, the Rev. S. H. Atkins, of Studley, Barnett Blake, Esq., lecturer to the Yorkshire Union of Mechanics' Institutes, and the Rev. Phineas Stubbs, Vicar of Well, subsequently addressed the meeting, which separated after passing several votes of thanks.

WAKEFIELD.—The Annual Report of the Mechanics' Institution states that the Exhibition and Bazaar held last year, with a view to paying off the debt upon the purchase of the building, realised upwards of £1,000.

The number of members at present on the books is 812, and the average attendance at the Monday evening lectures has been about 300. The lecturers were as follows:—Dr. Cantor, London—The Philosophy of Nutrition; Physionomy and Temperament. T. Brittain, Esq., Manchester—The Microscope applied to Animal Physiology. Mr. John Cameron—Cram and Culture; Books, and how to read them, illustrated by Readings and Critical Exposition of Passages; Artistic, Scientific, and Philosophic Culture. Rev. J. G. Miall, Bradford—The History of Transit, Ancient and Modern. Rev. W. H. Channing—On American Slavery. E. H. Durden, Esq., F.C.S., Leeds—New Materials for the Manufacture of Paper. Henry Currer Briggs, Esq.—On the difficulties attending the safe and successful working of Coal Mines. R. M. Milnes, Esq., M.P.—A Reading from his own Poems. S. Wilderspin, Esq.—On Infant Education. Rev. H. V. Palmer, York—Modern Fortification, its principles familiarly explained and illustrated. E. B. Wheatley, Esq., Hopton—On certain Industrial Schools in France. Frederick Dykes, Esq., Beverley—French Literature in the 12th and 13th Centuries. T. G. Wright, Esq., M.D.—The Magnetic Telegraph. Rev. J. S. Eastmead—The Vicar of Wakefield and its Author. Mr. Edmund Wheeler, London—Electric Telegraphs for Printing, Writing, and Copying; Stationary, Marine, and Locomotive Steam Engines, illustrated by Diagrams and Working Models. Mr. Samuel Braithwaite, Whitby—Jet and its Manufacture. Rev. W. R. Bowditch—The Science of Common Things. Dr. William Alexander, Halifax—The Injuries to Health incident to certain Mining and Manufacturing Processes. Rev. J. H. Ryland—The Early Life and Writings of Milton. Mr. John Newby, Ackworth—The Institution of the Knights Templars. J. B. Greenwood, Esq., Dewsbury—What are we to do with our Young Thieves? Rev. A. Perry, M.D.—On the Human Brain, considered in some of its relations, physical, intellectual, and moral. Rev. A. Cassels, Batley—On Shoddy, and its Manufacture. In addition to the above, a course of ten lectures was delivered by the Rev. W. R. Bowditch, "On the Scientific Principles of some Common Things," and one by the Rev. A. J. D'Orsey, on "What to learn, and how to learn it." An improvement as to number and quality has taken place in the classes, and the subjects taught are reading, writing, and arithmetic, French, pencil drawing, modelling, chemistry, and natural history. The Practical Art Class, for Free-hand and Mechanical Drawing, Designing, and Modelling, is conducted by Mr. J. White, head master of the Leeds School of Practical Art. This class meets every Tuesday evening, and affords especial advantages to Masons, Builders, Plasterers, Joiners, Cabinet-Makers, Upholsterers, Carvers and Gilders, Painters, Machinists, Ironfounders, and all whose business requires a knowledge of Drawing, Designing, and Modelling. Such members of the class as are sufficiently advanced, will be eligible to compete for the prizes and certificates offered by the Society of Arts, at the Examination which is to be held at Huddersfield next Whitsuntide.

MEETINGS FOR THE ENSUING WEEK.

Mon. Actuaries, 8.
Geographical, 8½. I. Lieut. Pim, "Plan for a further Search after the remains of the Franklin Expedition." II. Letter from Dr. Vogel, of the Central African Expedition.
Tues. Meteorological, 7.
Civil Engineers, 8. Mr. T. T. Jopling "On Recent Improvements in Water Meters."
Med. and Chirurg., 8½.
Zoological, 9.
Wed. Society of Arts, 8. Dr. J. Forbes Royle "On Indian Fibres."
Microscopical, 8.
R. S. Literature, 8½.
Archæological, 8½.
Thurs. Antiquaries, 8.
Royal, 8½.
Sat. Medical, 8.

PATENT LAW AMENDMENT ACT.

APPLICATIONS FOR PATENTS AND PROTECTION ALLOWED.

[*From Gazette, November 14th*, 1856.]

Dated 15th September, 1856.

2152. Felix Moreau, 39, Rue de l'Echiquier, Paris—Improvements applicable to the tops of omnibuses and other carriages.

Dated 1st October, 1856.

2290. Pierre Armand le Comte de Fontaine-Moreau, 39, Rue de l'Echiquier, Paris—An improved voltaic battery. (A communication.)

Dated 3rd October, 1856.

2321. Blanche Palmire Mosqueron, Widow Vilcoq, Paris—An improved lamp oil.

Dated 9th October, 1856.

2363. William Stettinius Clark, High Holborn—Improvements in the construction of churns for producing butter. (A communication.)
2370. John Shaw and Edwin Shaw, Glossop, Derby—Certain improvements in pianofortes, organs, harmoniums, and other similar keyed musical instruments.

Dated 11th October, 1856.

2385. Anton Bruno Seithen, 12, Alpha-place, Caledonian-road—Improvements in machinery or apparatus for cutting cork in the process of shaping and making stoppers of cork, and in the treatment of cork to be employed in the said processes, and to be applied to other useful purposes.

Dated October 17th, 1856.

2328. George Wilson, Glasgow—Improvements in power looms.

Dated 20th October, 1856.

2455. Robert George Barrow, 15, Wade-street, Poplar—A self-maintaining motive power obtained from water, air, or any other fluid or liquid.
2459. Charles Robert Freeman, Eaton, Norwich, and William Drake Key, Norwich—Improvements in manufacturing food for animals.

Dated October 22nd, 1856.

2479. Carl Heinrich Julius Wilhem Maximilian Liebmann, Fartown Huddersfield—An improvement in purifying water. (A communication).

Dated 23rd October, 1856.

2486. George Edward Johns, 4, Falcon-street, London—The application and adaptation of an optical or stereoscopic arrangement in the manufacture of boxes.

Dated 25th October, 1856.

2508. William Benson, Four Stones, near Hexham, Northumberland—Improvements in apparatus for drying grain, seeds, and other substances.
2510. Joseph Sexton, Leicester-square—Improvements in the construction of caustic holders, applicable also to the holding of leads, chalks, and other marking materials.
2514. Thomas Brown, Fenchurch-street—Improvements in capstans and windlasses.

Dated 27th October, 1856.

2515. Benjamin Ferrey, Trinity-place, Charing-cross—An improvement in producing ornamental plastering or stucco work.
2516. John Birkin, West Bridgeford, Nottingham—Improvements in dressing and cleaning wheat and other grain.
2517. Hugo Frederick Forbes, Florence, Tuscany—An improved copying press.
2519. Thomas Allen, Adelphi-terrace—Improvements in the permanent way of railways.
2521. Philipp Schaffer and Frederick Schaffer, Brewer-street—An improved handle for desks, deed and despatch boxes, bags, furniture, and other articles to which handles are applied.
2522. William Edward Newton, 66, Chancery-lane—Improved means of economising the waste heat of furnaces or fire-places. (A communication).
2523. Michael Dognin, Lyons, France—Improvements in machinery for making lace or net.

Dated 28th October, 1856.

2524. William Brodie, Belhaven, East Lothian—Improvements in the manufacture or production of roofing tiles.
2525. Edward Thornhill Simpson, Calder Soap Works, Wakefield—Improvements in the manufacture of soap
2526. Adolphe Ernest Ragon, Bernard-street, Ruesell-square—Improvements in apparatus for indicating and recording the speed of ships. (A communication.)
2527. William Septimus Losh, Wreay Syke, Cumberland—Improvements in the preparation of size, which may also be used as a waterproof varnish or coating.
2528. Jean Louis Marie, Paris—Improvements in raising, propelling, and forcing water and other fluids, and in obtaining motive power.
2529. William Armand Gilbee, 4, South-street, Finsbury—Improvements in the construction of smoke-consuming furnaces—(A communication.)
2530. Joseph Armstrong, Normanton—Improvements in the permanent way of railways.
2531. Samuel Russell, 12, Sheaf-gardens, Sheffield—Improvements in the manufacture of teapot-handles, knobs, door-plates, finger-plates, razor scales, and knife handles.
2532. James Kinder Cheetham, Rochdale, Lancashire—Improvements in the manufacture of iron and steel.
2533. Adolphe Aubril, Newman-street, Oxford-street—The novel application of a certain root to the manufacture of starch, paper, and cardboard.

Dated 29*th October*, 1856.

2535. Richard Hampson, Rochdale, Lancashire—Improvements in lubricating steam engines.
2537. Thomas Eyre Wyche, Camberwell—A method of disengaging metals from the matrix. (Partly a communication.)
2539. Thomas Clutton Salt, Birmingham—A new or improved method of coating with glass or enamelling surfaces of cast iron.
2541. Thomas Smith Henzell, South Shields—Improvements in the construction of ships or vessels.
2543. William Kopke, Hackney, Middlesex—An improved claspboard to hold documents for reference.
2545. Peter Fairbairn, Leeds, and Robert Newton, Liverpool—Improvements in machinery for dressing waste silk.
2547. John Thomas Way, Welbeck-street—Improvements in obtaining light by electricity.
2549. John Macallum, Kames Gunpowder Mills, Argyle, N.B.—Improvements in the preparation or refining of saltpetre.

Dated 30*th October*, 1855.

2551. Constantine John Baptist Torassa, Genoa—An apparatus for calculating the speed of vessels at sea, as well as obtaining the extent of their destination caused by the side winds.
2553. John Gibbon, Northfleet, Kent—Improvements in chaff-cutting machines.
2555. Louis Urion, Nancy, France—Improvements in match boxes or holders.

Dated 31*st October*, 1856.

2556. Charles Augustus Ferguson, Millwall, Poplar—Improvements in preparing timber for ship-building, mast-making, and other purposes.
2557. John Lawson, 2, Morris-place, Glasgow—Improvements in the manufacture of pile and other fabrics.
2560. Francis Cook Matthews, Great Driffield, York—Improvements in preparing manure.
2561. Samuel Worssam, Chelsea, and John Grist, Islington—Improvements in machinery for cutting and shaping wood.
2562. Henry Hutton, Reading—Improvements in lubricators.

Dated 1*st November*, 1856.

2563. Edward Joseph Hughes, Manchester—An improved mode or method of concentrating the colouring matter of certain vegetable substances.
2564. Joseph Browne, Liverpool—Improvements in the construction and working of ships' windlasses and capstans, part of which improvements are also applicable for steering ships and other vessels.
2566. Benjamin Stott, Salford, near Manchester—Improvements in machinery or apparatus for preparing, spinning, and doubling cotton, wool, flax, or other fibrous materials.
2567. John Young, Wolverhampton—Improvements in flooring cramps and lifting jacks.
2568. John Parbery, Northampton—Certain improvements in horse collars.
2569. James Coul Sinclair, Elgin, Moray, N.B.—Improvements in treating, preparing, and drying agricultural produce.
2570. Thomas Ainsley Cook, Newcastle-on-Tyne—Improvements in treating manganese ores.
2571. John Warne, Blackfriars-road—Improvements in beer engines.
2572. Josiah Stone, Park Terrace, New Cross, Kent—Improvements in the construction of force pumps.
2573. William Henry Moore, 3, Wenlock-place, City-road—Improvements in railway signals.
2574. William Joseph Curtis, 1, Sebbon-street, Islington—Improvements in lighting and ventilating railway carriages.

Dated 3*rd November*, 1856.

2575. John Jobson, Litchurch, Derby—Improvements in the manufacture of railway chairs.
2576. Samuel Tearne, and George William Richmond, Birmingham—Certain improvements in producing ornamental designs on the surfaces of fancy and other goods made of papier mache, wood, glass, china, earthenware, tin, iron, or other such like materials, the surfaces of which when made up are usually finished by staining, varnishing, painting, or japanning.
2577. James Nasmyth and Robert Wilson, Patricroft, near Manchester—Improvements in hydraulic pumps and presses for packing cotton and other articles of the like nature.
2578. Samuel Middleton, 15, Porter-street, Newport-market—Improvements in the manufacture of certain articles of leather without seams.
2579. John White, Glasgow—Improvements in preparing for spinning cotton and other fibrous substances.
2581. Ebenezer Erskine Scott, Dundee—Improvements in stereoscopes.
2583. John Kirkham, Tonbridge-place, New-road—Improvements in the construction of furnaces, ovens, or kilns for drying, baking, or burning pottery, earthenware, bricks, tiles, or other similar articles, and in the means of collecting and condehsing the smoke, gases, or vapours evolved from the fuel in such or other furnaces or fireplaces, or that escapes from the retorts and other parts of the apparatus used in the manufacture of gas.

Dated 4*th November*, 1856.

2584. Joshua Murgatroyd, Stockport—Improvements in machinery or apparatus for spinning, cleaning, doubling, and throwing silk, part of which improvements are applicable to machinery for roving and doubling cotton and other fibrous substances.
2585. Henry Bessemer, Queen-street-place, New Cannon-street—Improvements in the manufacture of rails, or railway bars, and axles.
2586. Ethan Campbell, Boston, U.S.—A new and useful or improved apparatus for propelling a navigable vessel.
2587. William Gray and John Tate, Newcastle-on-Tyne—Improvements in apparatus for washing.
2588. Joseph Jessop, West Gate, Bradford—Improvements in machinery for washing, wringing, and mangleing.
2589. Samuel Cotton, Broughton, near Manchester—An improved mode or method of regulating or governing lift, tilt, or other hammers worked by mechanical power.
2590. William Edward Newton, 66, Chancery-lane—Improved machinery for riming and tapping gas fittings. (A communication.)
2591. William Edward Newton, 66, Chancery-lane—Improved machinery for sweeping floors, streets, and walks. (A communication.)

Dated 5*th November*, 1856.

2593. William Weild, Manchester—Improvements in velvet or cut pile fabrics, and in looms or machinery used for weaving such velvet and other loop pile fabrics.
2595. William Edward Wiley, 34, Great Hampton-street, Birmingham—Improvements in pen-holders.
2597. James Fernihough, Dukinfield, Chester, and Robert Farrow, Leek, Stafford—A self-acting apparatus for regulating the supply of atmospheric air to furnaces, gas stoves, and other closed vessels used for the consumption of fuel or combustible gases, by preventing the formation of smoke therefrom, and thereby economising such fuel or combustible gases.
2599. William Clissold, Dudbridge, Gloucestershire—Improved apparatus for regulating the supply of water to water-wheels.
2601. Henry Hill, Stepney—An improvement in locks for bags and other like articles.
2603. Robert William Sievier, Upper Holloway—An improvement in the mode of treating saccharine juices in the manufacture of sugar.

WEEKLY LIST OF PATENTS SEALED.

Sealed November 14*th*, 1856.

1138. Uriah Scott.
1145. William Evans.
1148. William Norris and Robert King.
1149. James Young Simpson and Wyville Thomson.
1151. Robert Foulds and William Bracewell.
1159. William Thistlethwaite.
1166. Richard Coleman.
1167. David Curwood.
1171. Louis Cornides.
1172. Johan Jacob Meyer.
1175. Richard Knight.
1187. William Maugham.
1225. Germain Barruel.
1261. John Roberts.
1262. Thomas Charlton and William Turnbull.
1263. James Baird.
1292. Henry Bessemer.
1293. William Gossage.
1308. James Nasmyth.
1507. James Aikman.
1815. Thomas Wicksteed.
2952. Joseph Crossley and James Bolton.
1977. William Webb.
2051. John Morrison and Samuel Amphlet.
2121. John Blythe Robinson.

Sealed November 18*th*, 1856.

1191. James Anning Gollop.
1199. Robert Pemberton.
1209. Macleroy Neilson.
1220. William Richelieu Hodges.
1222. Alexandre Tolhausen.
1237. John Gedge.
1307. Delia Avery.
1329. Reuben Boyce Wigley.
1345. Duncan Lang.
1375. Richard Archibald Brooman.
1383. Henry Benson James.
1385. William Bayliss.
1461. George Davies.
1506. John Portus.
1605. Henry Page.
1687. Charles Carey.
1807. Constantine John Baptist Torassa.
1981. Henry Bessemer.
1987. Charles Carey.
2097. John Watson and Charles Frederic Halle.

PATENTS ON WHICH THE THIRD YEAR'S STAMP DUTY HAS BEEN PAID.

November 11*th*.

2627. William Austin.
2682. Moses Poole.

November 12*th*.

2634. Henry Willis.

November 13*th*.

2639. William Smith.
2641. Charles De Bergue.

November 14*th*.

2768. Prix Charles Jean Baptiste Sochet.

November 15*th*.

2656. David Pratt.
1680. James Melville.

WEEKLY LIST OF DESIGNS FOR ARTICLES OF UTILITY REGISTERED.

No. in the Register.	Date of Registration.	Title.	Proprietors' Name.	Address.
3901	Nov. 6.	Portable Iron Military Music Stand	Key, Rudall, and Co.	Charing Cross.
3902	,, 8.	Back Pulley	Taylor, Allen, and Taylor.....	Birmingham.
3903	,, ,,	Boiler for Hot-water Apparatus	John Pedley........................	Charlton, near Manchester.
3904	,, 11.	Coffee Pot..	Henry Craigie	Edinburgh.
3905	,, 13.	A Travelling Rug or Wrapper..............	Leonard Hicks .... John Edward Smith	Leeds. 6 and 7, New Kent-road.

Journal of the Society of Arts.

FRIDAY, NOVEMBER 28, 1856.

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SECOND ORDINARY MEETING.

Wednesday, Nov. 26, 1856.

The Second Ordinary Meeting of the One Hundred and Third Session was held on Wednesday, the 26th inst., Col. W. H. Sykes, F.R.S., Chairman of Council, in the chair.

The following Candidates were balloted for, and duly elected :—

Anthony, Charles.
Gilman, William Anthony.
Lefevre, George Shaw.

The following Institution has been taken into Union since the last announcement:—

424. Northowram Mechanics' Institute.

The following Colonial Institution has been taken into Union since the last announcement :—

Natal Agricultural and Horticultural Society.

The following Schools have been taken into Union since the last announcement :—

Birmingham, Bristol-road School.
Making Place Hall (near Halifax) Academy.

The Paper read was :—

INDIAN FIBRES, BEING A SEQUEL TO OBSERVATIONS "ON INDIAN FIBRES FIT FOR TEXTILE FABRICS, OR FOR ROPE AND PAPER MAKING."[*]

By J. Forbes Royle, M.D., F.R.S.

In proposing to re-introduce the members of the Society to a subject which they so recently discussed, I feel that some apology is necessary, the more particularly as it is not one to which I myself am specially wedded. Indeed, in Paris, I promised our Secretary a Paper on the Oils and Fatty Substances of India, a promise which I hope yet to be able to redeem. An increased supply of materials for cordage, clothing, and paper-making, is, however, not an unimportant one, as I have endeavoured to show; and though my paper on this subject was written at the request of the Council, and that on paper-materials at the call of the Board of Trade, and both in consequence of the anticipated deficiency of the ordinary sources of supply, I had long before endeavoured to have turned to account the true hemp plant which grows in such abundance in some parts of North-Western India, and had, at a still earlier period, thought, like so many others, that as India grows and exports such large quantities of linseed, there must be a corresponding production of flax, and, as none was collected, there must be proportionate waste.

My attention has been directed to these fibrous substances in a greater degree than to some other Indian products, because India appears to me to be pre-eminently a country for fibres, and because I believe that a great mass of valuable material, which now yearly runs to waste, may more readily than almost anything else be turned to profitable account. In the first place, the vegetation of the country is characterised by a teeming abundance in species of plants known to abound in fibres. Thus, without enumerating the gigantic grasses, the *plantain* and the *marool* yield large quantities of white fibres. Among the palms, in addition to cocoa-nut fibre, we have the black *Ejoo* fibre, remarkable as well for strength as for incorruptibility when exposed to wet. As the lime tree yields Russian bast, so the jute and its congeners of the same family are now equally indispensable to our manufactures. As the leguminous and malvaceous classes of plants include several groups, of which numerous species abound in fibres, so do also the *Asclepiads* and the nettles; combining to afford us any variety of fineness and of strength which we can expect, or I may almost say wish for in fibres. The climate, moreover, is favourable for the growth of these fibre-yielding plants; for as most of those to which I have to allude belong to the indigenous flora of India, their period of growth is during the rainy season, when there is suitable heat and abundant moisture ; thus is secured the rapid growth of the parts of vegetation in which almost entirely these fibre abound. As the rainy season comes to an end after three, or in some parts, four months, there is usually fine weather for the separation and preparation of these fibres. In these operations, however, I believe the natives may very profitably be assisted with some cheap machinery, and be taught improved and yet simple methods of preparing their fibres for market. There is, moreover, great abundance of unoccupied land as well as of cheap labour, and easy accessibility, either by sea or river carriage, to the places where the fibres chiefly abound. It has no doubt been in consequence of the suitableness of all these essentials that the import of fibres from the East has so rapidly increased. Thus, as I have already quoted from McCulloch's Commercial Dictionary :—

Hemp Imported into the United Kingdom.

	1831.	1851.
From Russia ....cwt.	506,803	672,342
From British India..	95,472	590,923

There was a falling off in 1852 and 1853, but an increase in 1854 and 1855, the imports being :—

	1854.	1855.
Hemp....................	125,951	69,464
Jute......................	443,558	520,741
Other fibres	741	963
	569,250	594,068

I am indebted to Sir Emerson Tennant for the following return:—

An Account of the importations of Hemp in the nine months ended 30th September, 1856, distinguishing the Quantities imported from British Territories in the East Indies.

	Quantities Imported into the United Kingdom in the Nine Months ended 30th September, 1856.				
	From British Territories in the East Indies, exclusive of Singapore and Ceylon.	Ceylon.	Singapore,	Other Countries.	Aggregate of the Importations.
	Cwt.	Cwt.	Cwt.	Cwt.	Cwt.
Hemp, dressed	593	...	...	13,025	13,618
——— undressed	37,777	...	209	342,165	380,151
——— tow, or codilla of hemp	...	...	...	10,095	10,095
——— Jute.....................	529,817	...	...	16,311	546,128
——— Other vegetable substances of the nature and quality of undressed hemp	893	1,431	...	1,876	4,200
	569,080	1,431	209	383,472	954,192

JOHN A. MESSENGER.
Office of the Inspector-General of Imports and Exports,
Custom-house, London, Nov. 22nd, 1856.

The soil and climate are also favourable to the other plants which have been introduced from other countries;

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[*] See *Journal of Society of Arts*, vol. ii., p. 366.

thus, the pine-apple now abounds in Assam and in the Indian islands, also in Pegu: the agave or American aloe is quite at home in the comparatively dry climates of the Deccan and of Mysore. The flax plant is itself extensively cultivated in the plains, but only on account of its linseed, as also the true hemp plant; the latter for the intoxicating secretions of its leaves.

By some it may be asked, why, if so favourable to the production of fibre, does not India produce larger quantities, or a better quality of cotton. The question might be answered by stating that cotton is not fibrous but cellular tissue. But a more proper answer would be, that cotton is a production of the fruit and not of the stem or leaves of a plant; and it does not follow that a climate which promotes the growth of certain parts of vegetation is also favourable for the maturation of fruit; indeed, the converse is not unfrequently the case. Therefore, though the seasons may be well suited for all the purposes of indigenous species, they may not be so for those which are foreign to the soil. This is the case with the American cotton plant; for it is not the short-stapled Indian cotton which our manufacturers require, but American cotton grown in India. Though this grows vigorously in most parts of India during the rainy season, it is unable, with its short roots and broad expanded leaves, to bear the transition from the moisture of the rains to the comparative dryness at their conclusion. Failure has therefore ensued in many places, but in others, as the district of Dharwar, there are 60,000 acres under cultivation with American cotton; but there the plant has the advantage of the influence of the two monsoons. I believe it will be possible in other districts, as the irrigation canals come fully into operation, so to moderate the transition from moisture to dryness as to allow of the full ripening of the fruit, and, therefore, of the formation of good stapled cotton.

To return, however, to our subject. I have myself been induced to return to it, because some new fibres of good quality, and old ones from new situations, were sent to the Paris Exhibition. Much additional information has been obtained on some points, and ample confirmation of the views I formerly promulgated. I have been encouraged also to proceed with this subject, from the attention which it has excited, and from the numerous inquiries which continue to be made of me respecting these Indian fibres: likewise from my having been informed from the best sources that in the busy hives where the fibre manufactures are chiefly carried on, they yet require still larger supplies, either of those which are in commerce, or of such as are most like them, and therefore, most easily substituted. I know, also, that several engineers are employed in ascertaining improved methods of separation and of preparation, not only of fibres in general, but of these in particular. And, though last, not the least important result will be, that improved information cannot fail to be useful to some of our fellow-subjects of the East, who are, perhaps, apt to depreciate indigenous products; while some of them may be induced to grow or to use what is valuable in neighbouring districts (for some complain that there is no market even for a valuable product), while a few may perhaps be induced to send theirs in an improved state, in order to realise a higher price in the market.

Such investigations, though they may not appear practical, are, however, of great use in enabling the inquiring and intelligent manufacturer to become acquainted with the properties and probable quantities of new substances. The broker is able to say something more respecting them than that "they are unknown in the market," and therefore of no value. As a further consequence, the local merchant or capitalist abroad is able to purchase, or make advances on what there is some probability of selling at reasonable prices in foreign markets. Finally, the European planter or native cultivator is encouraged to grow or to prepare what appears to him of the greatest value, because it finds a local purchaser; for he has little or no knowledge of what is of value in the foreign market. Any one of the points of this circle of connections being omitted is sufficient, as has often been experienced, to put a stop to progress in a new course. Such inquiries are, moreover, of especial utility if carried on in connection with a Society like the present, where every subject has the advantage of being submitted to the examination of men who, by their scientific attainments and practical knowledge, are the best qualified to form a correct judgment on the value of unknown products or of the new inventions brought before them. For, as I before stated, it is only by the union of scientific principles with practical knowledge that any great results are, in the present day, to be obtained. For, if we rely upon the latter only, we may, sometime, when apparently proceeding at railway speed, be brought to a sudden, and occasionally disastrous termination by the neglect of some single point; while, if we rely upon scientific principles only, we may often be shunted off, though we can avail ourselves of legitimate modes for returning to the course we were wishing to pursue.

Having on a previous occasion, as well as in a separate work, dwelt on the great variety of Indian fibres, of which we now have a very extended display, it is not my intention either to enumerate or to describe the great variety of fibres which are, and may be, produced in India. But I propose rather to dwell upon those which are at present most worthy of attention, because possessed of superior qualities, or procurable in larger quantities, or because they are wanted by manufacturers in Europe for particular purposes. Therefore, I shall arrange my observations under the heads of the purposes to which different fibres are applicable, rather than under the names of each particular fibre,—thus:—

1. Basts and barks.
2. Platting and mat-making materials.
3. Cordage fibres.
4. Textile fibres.
5. Paper materials.
6. Adaptation of machinery for preparing fibres in India, and methods to be adopted for obtaining fibres in large quantities from India.

Basts and Barks.

Though I commence my observations with basts or barks, it is not because I think them of primary importance, for I am well aware that carriage and freight must operate against their being brought in any large quantities from such great distances; but still, some useful information may be elicited respecting them, and applied to other subjects. The bast now chiefly used is that employed for making Russia mats. Of these about 3½ millions were annually exported from Russia, and of them from 500,000 to 800,000 were brought to this country, selling for about £5 per 100; but gardeners have, for some time been in the habit of tying up plants with Cuba bast. The origin of this was, until lately, quite unknown. In describing the basts or inner barks of several trees which had been sent from Assam, &c., I stated, that among the Indian species of Grewia, as well as among the Malvaceæ, there were numerous bast-yielding plants. I specially mentioned, as those used by the natives, the bast of *Hibiscus arboreus*, or *liliaceus*, *Sterculia villosa*, and others. It is curious that Sir W. Hooker, in a late number of the *Journal of Botany*, has ascertained that Cuba bast is produced by a West India tree named *Hibiscus elatus*,* and which appears to be nothing more than a variety of *Hibiscus liliaceus*; that is the very same species as that I have just mentioned as one of those of which the bast is in use by the natives of India. Dr. Lindley, in the *Gardeners' Chronicle* of Nov. 8, hopes "that this useful material may now be prepared in our colonies, and sold at a lower price than it bears at present."

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* *Journal of the Society of Arts*, Vol. IV., p. 786.

Nothing would appear to be more easy than to provide the same, or an efficient substitute, if we look at the various basts which have been sent from different parts of India, as, for instance, that of the *Beemul*, from as far north as the Deyra valley, and the *Butteah*, from the Assam valley. But, for the purposes of foreign commerce, those from Akyab, the seaport of Arracan, seem most desirable, as they are abundant, cheap, and easily divisible into fine, pliant, and knot-tying fibres. Some sent to the Chiswick-gardens of the Horticultural Society were favourably reported upon. The retail price of several, even when twisted into rope, in Akyab, is one rupee per maund, that is, three shillings per cwt. For this sum, therefore, they might be put on board ship; and if bast, even when twisted into rope, we may ask why not paper stuff at about the same sum. Various experimental fibres have been sent from Calcutta for £3 and £4 per ton for freight. The rapidity with which the exports from Akyab have increased is something remarkable. The value of exports in—

	United Kingdom.		To all parts of the world.
1854-55 was ...	Rs. 3,568,169	...	5,357,801
1855-56 ,, ...	8,112,408	...	10,300,113

The western coast of the peninsula of India being also moist in climate, is equally favourable for the growth of bast or fibrous material. Several such have been sent from Travancore, for which Cochin is the most convenient port for shipment. As an instance, I will only mention the bark bags which are employed for holding rice. These are formed of the bark of *Antiaris saccidora*, which is common in the jungles of Canara, near Coorg, and Travancore.

These bags are made by cutting a branch corresponding to the length and diameter of the sack wanted. It is soaked a little, and then beaten with clubs until the inner bark separates from the wood. This done, the bark is turned inside out, and pulled down, until only a small piece of it remains attached to the wood, which is to form the bottom of the sack, and from which the remainder is then sawn off. If we look at the immense mass of the fibrous matter, and the white colour of the inner layer, and how the fibres of the several layers cross each other, one cannot but be struck with the apparent fitness of the whole for being beaten into half-stuff for paper-makers; and regret that so much valuable material must be lost, when only the thick part of the branches is made use of for making these sacks for holding rice.

Some bast has been imported from Arracan by Major Lyell, but it is difficult to find a purchaser for a new article. It is, however, of good quality, as the layers, when separated, tie knots well.

One ton of Gharoo fibre, or rather bast, has been sent from Malacca, to have its value ascertained, as large quantities could be procured there. The gharoo is known in commerce; but it is the wood of this tree in its decayed state, which is well known as the high priced *lignum aloes*, so valued as incense. The bast has been sent both in its twisted and untwisted state. It is a mass of lustrous fibre, of great tenacity.

Platting and Mat-Making Materials.

These being, like the basts, bulky material, and of low price, cannot be expected to pay the expenses of freight, therefore, few observations will suffice to show the abundance of materials. India has long been famous for its mats, as the people produce some of the finest known, which are often to be admired for the elegance of the patterns with which the material is coloured and woven. Mats being suitable both for sitting or sleeping on the ground, and especially pleasant in hot weather, are made of all qualities and prices for different classes of society. Thus, some are made of grasses, and others of the Bulrush, in different parts of India; some of the leaves of the Kaldera bush or screw pine; many of the Cadjan or dried leaves of the Palmira tree; some stiffer in nature, but useful for a variety of purposes, of split bamboos. The most famous mats are, however, made of the split *Cyperus tegetum*, in Bengal, and of the same or a similar species, *C. textilis* in the Indian peninsula, but the kind especially called *seetul pateer*, or cool mats of Bengal, are made of the *Phrynium*, now *Maranta dichotoma*. This, as well as the former, is well adapted for platting of all kinds.

Twine and Cordage Materials.

Though I have arranged the several fibres under what are apparently useful heads, it is evident that the arrangement is an arbitrary one, for some may be used for each and all other purposes to which such material is applicable. These are, therefore, arranged rather according to their present appearances than to what they may be ultimately brought, as there is no doubt that preparation will convert a bast into a cordage fibre, and a still more careful process, bring it to a state fitting it for the highest textile purposes.

Having before given a detailed account of the great variety of cordage materials procurable in India, I need not do more than refer to some of the new fibres, or to old ones from new situations, which were sent to the Paris Exhibition, and select those for remark which seem the most likely to become extended articles of commerce. In the first place, we have seen that the grass called *Moonja* is employed both on the Ganges and Indus rivers for tow ropes, and a kind of cotton-grass for making bridges in the Himalaya. Though coir rope is well-known, the black Ejoo deserves to be equally so, from its great strength and incorruptibility under water. The Pita or Agave, commonly called aloe, is used both in mines and for the rigging of ships in the New World. The plant has become common in, and is well suited to the dry parts of India. This is also indicated by specimens sent from different and distant parts of the country. Ropes made of it are coming into use among the natives, and the fibre might be obtained to a considerable extent. It has been said that it is liable to rot when exposed to wet, but this is not found to be the case in South America. Much will depend upon how experiments are made, for if the mucilaginous parts of fibres are not sufficiently separated, and a bundle of fibre or rope is macerated in a tub of water, or exposed to wet in a warm climate, fermentation will take place and decomposition ensue. All which would not be experienced if the fibre was cleaned in running water, and then exposed to wet and afterwards to dry or moist air. In experiments tried at Toulon, Calcutta and Madras, Pita ropes were found to possess great strength.

Pine-apple and marool fibres, though fitted for better purposes, have also been made into rope, and some of the former, made into a rope, 3¼ inches in circumference, bore 57 cwt., though the Indian Government require ropes of that size to bear only 42 cwt.

Manilla hemp is now well known as a fibre able to bear great strains, and its rope, therefore, is much used for the rigging of ships, as well as in warehouses. The plantain being, like it, a species of Musa, it has been supposed that its fibre might be turned to useful account, especially as the plant is grown in such vast abundance on account of its fruit, and the fibre is an annual refuse. There is no doubt that much useful fibre may be obtained from this plant, and of which cordage may be made, applicable to a variety of ordinary purposes, especially if carefully prepared, that is, without steeping in water, but by simple pressure and scraping. Indeed, a twelve-thread rope of plantain fibre, made in India, broke with 864 lb., where a similar rope of pine-apple fibre broke with 924 lb.

As it is desirable to know the quantity of fibre which may be obtained from a certain quantity of ground, we may refer to the results of experiments which have been recorded, though all require to be carefully reported :—

New Zealand Flax	1792 lbs. per acre
Moorva, or Marool	1613 to 3226 lbs. in two crop
Plantain	1800 to 2500 lbs. per acre.

It has been calculated that with appropriate machinery, in suitable localities, the expenses of obtaining such fibres ought not to exceed from £9 to £10, and that they might then be landed in England from £13 to £16 per ton.

The preceding observations refer to the fibre of endogenous plants, but those of exogens are equally, if not more valuable, for almost all the purposes to which fibres are applied. Already we have seen among the basts, a number of barks which have been merely stripped from trees and twisted into strong, and for many purposes very serviceable ropes. We have here a sufficient number of them to convince you of the abundance as well as of the goodness of such materials. But it would not be difficult greatly to extend the number, for several families abound in plants having barks possessed of similar properties. Besides these basts, there are numerous fibres which are sufficiently separated from each other to be twisted into yarn, and subsequently into ropes. They are all possessed of sufficient strength and flexibility to permit their being well fitted for ordinary, but some of them may be for any purposes to which fibres are applied. But I think it preferable to confine myself to two or three only of these fibres, in order that the attention of manufacturers may be concentrated on them, so that planters in the East may be induced to give their exertions to the extended cultivation and improved properties of those fibres which seem most likely to respond to the demands made on them for quantity or quality, or both combined in one.

I do not at present refer to the jute, of which so many thousand tons are yearly imported, nor to the sunn of Bengal, which has been so long used as a substitute for hemp. Of this the peculiarities seem to me to depend as much upon the mode of preparation as upon the peculiarities of the plant. But I would beg to call attention to two or three fibres which may or may not be produced by different plants, but which have been several times picked out by practical men as good substitutes for hemp, and perhaps also for flax.

These may be arranged under the head of the Brown hemp of Bombay. This, it is curious to note, is produced by two different plants: one, the Ambaree (*Hibiscus cannabinus*) or Deckanee hemp, and the other the Tāg (*Crotalaria juncea*) or Conkunee hemp. Though the fibre of this last plant, as prepared in Bengal, is totally different from that of the other, yet, as prepared in the west of India, there is a great similarity between them. This, I have already stated, is shown in fibres sent from Bombay on former occasions. It is found in two specimens sent from Sattara; one is the Ambadee (*Hibiscus cannabinus*), much used there for ropes, and the least troublesome to prepare, costing about nine pie per lb.; and the other is the Tāg (*Crotalaria juncea*), used both for sacks and ropes, but costing about 11 pie per lb. Both are well adapted for cordage, as is also the Janapa, the same *Crotalaria juncea* from the Malabar coast, which has always been famous for the excellence of its fibres.

The district of Canara, which, indeed, is only a prolongation of the same Malabar coast, has sent some specimens of fibre which have been much admired for the fineness, strength, and clean state of preparation of the fibre. They have been sent without any information respecting them. One is the *Naroo*, or the fibre probably of the *Crotalaria*, and the other is the Poondy naroo, perhaps the above *Hibiscus*. So, further down the same coast, we have the *Wuk* naroo, in Travancore, which might, even in the state in which it is sent, be used at once as a substitute for flax. That there would be no difficulty in obtaining this fibre in considerable quantities from Canara, is evident from a statement recently made by the collector of this district, that is, he has "a full belief that, if there should be a steady demand for this hemp for two or three years, it would become one of their staple products, instead of being cultivated in small quantities only for fishermen to make their nets and lines." He moreover adds, that there are thousands of acres unoccupied, but which are well fitted for the culture of this plant, as the soil is exactly similar to that of the places where it now grows. All the low land fit for rice cultivation has been long taken up. This is a district which runs for many miles along the west-coast.

The production of fibre of this quality is not confined to the western coast of the peninsula. Some equally good is produced in some other districts, for instance, the Janapa naroo of Ganjam, and the so-called hemp and flax from Goomsoor; and it has also been sent of excellent quality, long and well-cleaned, from Chota, Nagpore. This is very similar to Mr. Williams's Jubbulpore hemp, which I formerly showed, and as yielded by *Crotalaria tenuifolia;* and, though Jubbulpore is far in the interior, Mr. Williams sends it to Calcutta, and even to this country. Even still further in the interior, we have a very excellent specimen of the same kind of fibre from the Punjab, and which was sent as the packing of some large models from Lahore.

As these last localities are far in the interior, it might be supposed that there would be difficulty in procuring these fibres. There is, however, a very excellent one, which has been unaccountably neglected, as it may be obtained even in Bengal. That is the Dhunchee (*Sesbania aculeata*) which is cultivated there, and forms a coarse but strong substitute for hemp. Ropes made of it have the objection, for some purposes, of contracting. The price is usually under that of jute; in the interior about 3s. per cwt. Excellent specimens of Dhunchee rope have been sent from Calcutta; some, having been submitted to various experiments, has been so satisfactorily reported upon, that the fibre appears to me well worthy of being imported, as well as the fine specimens of what is here called Brown hemp.

We may now proceed to notice the new specimens of the true hemp, or *Cannabis sativa*. In my former lecture I called attention to what was considered one of the strongest of fibres, and which I called Kote Kangra hemp, as it was supposed to be the produce of the true hemp from the newly acquired portion of the Punjab Himalayas. From the representations made to them, the Court of Directors of the East India Company ordered that from five to ten tons, as convenient, should be sent to this country from Kemaon, the Deyra Doon, and Kote Kangra, it order that the cultivators might have some inducement to grow the plant, and that manufacturers here might become acquainted with the properties of the Himalayan hemp, so that it might become known to, and established in, the market here. The experiment has not, as yet, been very successful.

First, of 171 packages of hemp fibre received *viâ* Bareilly from the Assistant-Commissioner of Kemaon, it was reported by the master attendant in Calcutta, that the whole was more or less damaged from having been wetted by fresh water, so that one-third was entirely destroyed; but the rest having been carefully garbled, aired, and dried, was compressed into twenty-six bales. Of these twenty-three were in good order and three slightly damaged. Some specimens are here, and all will shortly be sold by Messrs. Noble.

The next import of this true hemp from the Himalayas, was grown in Mandoo and Kooloo, in the Kangra district. There was some difficulty in collecting it, in consequence of its being the first occasion, and therefore it was not ready for despatch until the beginning of the rainy season. Somewhere about two tons were sent down the Indus to Kurrachee, from whence it was forwarded to Bombay, all by water-carriage. Unfortunately this, like the Kemaon sample, got wetted, and therefore damaged in transit. It was, therefore, considered doubtful whether it was in a fit condition to send to England. Its quality, however, on being tested in Bombay, was found to be greatly superior to what was expected, and it was carefully sent in a cabin from Bombay, but not having been pressed, its freight has cost more than it was worth. It is valuable, however, as the first specimen that has been imported, and we have it here to judge of the probable value of this new source of hemp.

One important fact is mentioned in the correspondence, and that is, that fleets, instead of single boats, now navigate the Indus, and that the freight by them had been reduced from R. 1 2 to 10 annas per maund,* from Lahore to Kurrachee.

Textile Fibres.

In Mr. Yates's admirable work, entitled "*Textrinum Antiquorum*," there is a map of the ancient world, according to the raw materials principally produced in it for weaving, and it may serve to give an idea of the extent and variety of India to state, that it embraces all the raw materials which are considered to characterise the divisions of the ancient world. Thus, camel's wool and goat's hair in Sindh, sheep's wool in north-west India, and with hemp in the Himalayas, are all worn, as silk is in Assam, and cotton all over the plains of India. In addition to these, we might add a number of vegetable fibres used for textile purposes. Thus, jute, sunn, and ambaree, are three different fibres which are woven into cloth in different places. So the white fibres of the moorva, or Indian bow-string hemp, are woven into muslin-like fibre, so abundant in the jungly salt soils of the coast; this is still more the case with the pine-apple, which, from its fineness, and the abundance in which the plant occurs, is invaluable; for instance, in the neighbourhood of Singapore, and in the adjacent islands, there are said to be thousands of acres covered with this plant, and there the plant grows so readily, that the supply may be considered inexhaustible. It is named pigna by the Spaniards of the Philippine Islands, from the resemblance of its fruit to the cone of a pine tree. Hence the name of *pina* cloth, sometimes called *batiste d'ananas*, which we sometimes see richly-embroidered by the nuns in the convents of Manilla. Both names are interesting, the one as characteristic of the cloth, and the other of the plant which yields one of the kinds of fabric which is made and exported from the Philippine Isles, and which is characterised by its muslin-like character, though somewhat wiry in feel, and apt to become of a brownish hue. There is yet another kind of fabric which, unfortunately, is by some also called *pina* cloth, but which I cannot believe to be produced by the pine-apple, as the fibres are broader, softer, and have a lustrous appearance. I have been unable to obtain any positive information respecting the source of this fabric, but I believe it to be the produce of the same plant as that which yields Manilla hemp, for we are told that the plant called *Abaca* (*Musa textilis*), is grown to a considerable extent; that the outer layers yield fibre fitted for cordage, and the inner ones for weaving into fabrics, such as web cloths, which are described as having lustre, softness, and white colour. The fibres for fine weaving are rendered soft and pliable by beating them with a wooden mallet. I am further confirmed in the correctness of this opinion, from the fibres of the plantain, which is a species of of musa, when carefully prepared, having a glossy and silk-like appearance. Dr. Hunter found that all steeping in water is injurious, and that it is better to separate it by pressure and scraping at once, and the more carefully it is cleaned the stronger is the fibre, and more glossy. As I formerly dwelt upon the great importance of preserving the fibre of the plantain, which is so extensively cultivated for its fruit, which, if too abundant, we may preserve, when ripe, or prepare plantain meal from it before it is quite so, I believe that not only will the fibre be useful for cordage for ordinary purposes, but a part may be employed for textile purposes.

Though jute in the plains, and hemp in the Himalayas are both employed for textile purposes, we will next notice the attempts which have been made to produce flax in India.

Flax and Linseed.

Of the great abundance of the flax plant in India we have a sure proof in the increasing quantities of linseed which are yearly exported from India. Thus, in 1851, 93,814 cwt., and in 1854, 362,882 cwt., were imported into this country.

Many have thought that, as India produces so large a quantity of linseed, and no flax, there must be a great waste of useful material. There is no doubt some truth in the former statement, but not nearly to the extent that is supposed; for, in consequence of the mode of culture and the peculiarities of climate, the stem is short and branching, producing much seed and a little coarse flax, which is separated with difficulty, from the branching nature of the plant. The appearances, indeed, seemed so favourable, that a company was established by men acquainted with India: a Belgian cultivator, and Belgian preparer of flax, were sent to Bengal. Though flax was produced—said to be worth from £40 to £60—no permanent effect was produced, though it was said to have cost one experimentalist only from £12 to £15, and who ought to have succeeded, as he says that the expenses of cultivation were paid for by the seed; but others state that it cost £31 and £32 a ton. I cannot, however, think that which is done successfully in Egypt is impossible in every part of India. Indeed, I was of opinion that it might be successfully produced in Sangar and Nerbuddah territories, in consequence of the soil and climate being such as will probably suit the plant, deficiency of moisture being seldom complained of. But I have not heard the results of Mr. Williams' proposed experiments.

Some of the finest linseed having been produced in the neighbourhood of Saharampore, in 30 degrees of north latitude, and some flax which was grown from this seed having been highly thought of at Liverpool, it was determined to have an experimental culture under Dr. Jameson, who so successfully conducts the cultivation and manufacture of tea. Here there is a variety of climates, as in the plains at the head of the northern Doob, in the Door valley, and on the hills themselves.

The report has not been yet received, but in a private letter I lately received from him he stated that they had succeeded completely in the cultivation of the plant, but had failed in the separation of the flax. This is a thing that can be easily remedied.

The Agricultural Society of the Punjab first produced some flax in the winter of 1853-54. Samples of this having been sent to Calcutta it was pronounced to be the finest flax that had been grown in the country. The Indian Government having been applied to, authorised through the Society that prizes should be given for the largest area of land cultivated with the flax plant, and also the purchase of the entire crop of merchantable flax, as well as of the seed, at the current Bazaar rate; if no purchasers should present themselves. Directions were published and distributed, and preparations made for the reception of the large quantities of flax which were expected to be brought to Lahore. The Society was also authorised to rent some land, which was to be cultivated under their own inspection, and the flax prepared by a European who had had some practical experience of the preparation of flax in Europe. On application, some specimens of tools were sent over, as well as European seed, small quantities by the overland route, but the larger quantity by sea, and of different kinds, as Riga, Dutch, American, English, and Irish, purchased from the highly-respectable house of Wrench and Co., of London-bridge.

Among the results of this experiment, it is observed, in the Society's Report, "In the course of the experiments of the past season, both as regards cultivation and preparation of flax, numerous facts, of more or less importance, have been elicited. For instance, it is found that much, if not all, of the linseed of Central India bears a white instead of a blue flower, and that the seed also differs materially. Also, that the flax of suitable Indian localities, though from Indian seed, is capable, if properly sown and plucked at the right time, of producing excellent fibre, and with a moderate degree of manipulation." This, indeed, seems to be the only proper course to pursue, for it would hardly be possible to establish any extensive culture, if it was necessary to import seed from Europe.

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* The maund is considered equal to 82lbs. The rupee is equivalent to 2s. It contains 16 annas, each anna being 12 pie.

The attempt to induce the natives of the Punjab to cultivate linseed on a large scale and to produce flax, seems to have been as successful as could reasonably have been expected. For the breadth of land under culture increased from 3,453 acres in 1853-54 to 19,039 acres in 1854-55. But though the Government had offered to buy all the seed, if no other purchasers offered, yet of the 150,000 maunds of seed which were calculated to have been produced, only 11,300 maunds were brought to be purchased by Government, the rest having been bought up by native merchants. The net outlay by Government up to January, 1856, having been Rs. 29,657 15 7, and the year's proceeds Rs. 33,150 14 3, giving a net surplus of Rs. 3,444 8 4. Such a favourable result, in the first year of an experiment, was, no doubt, due in part to the unusually high prices prevailing during the war with Russia. The seed was, no doubt, of a good quality, as is most Indian linseed, from the quantity of oil it yields.

Some of the natives of Punjab having been in the habit of separating fibre flax on their own account, and so large a breadth of land having been sown, on the government engaging to purchase all the seed and also fibre that was produced, if no other purchaser offered, it was expected that a very large quantity of fibre would have been produced. Preparations were made by the Agricultural Society to receive it, and their Secretary wrote to different Chambers of Commerce, informing them of the expected out-turn of flax from this new locality. These anticipations were not, however, realised, for the fibre which was brought in was small in quantity, though some of it was of good quality. The straw brought in amounted only to 2,365 maunds, some of it green, some dry; about half had to be thrown away, and only 110 maunds of merchantable flax were produced, and this was bought by Messrs. Harton, rope-makers, for eight rupees a maund, and sent down to Calcutta. Indeed, it was hardly to be expected, that men who had been in the habit of thin sowing a plant for seed, would all at once sow it thickly enough to produce good fibre, especially as prizes were to be given for breadth of culture. I myself had in some measure anticipated this result, for I stated, "But while the best method of culture will be ascertained by the Society, on their own cultivation, it is feared that the length of stems required (3 feet 6 inches) will exceed much of what may be grown by the natives (Indian Fibres, p. 196). There is, however, a favourable prospect of the successful culture of fibre in the Punjab. None of the specimens of flax grown have yet reached the India House. But I have a small sample of flax grown by Mr. Wagentreiber, in Upper Assam, and another sample sent by the Dundee Chamber of Commerce, which is said to have been prepared from straw grown 800 miles from Calcutta (though it is not said in what direction). The Directors consider that fibre, of the quality of the sample, would be useful in the manufactures of Dundee, could it be laid down in this country at a price not exceeding £30 a ton; and yet in the report which accompanied this article, the straw is said to be intrinsically a very poor article, and the quality of the finished sample also indifferent; but, nevertheless, it is a marketable article. Considering how frequently inquiries have been made to grow flax, even though it should be of a coarse quality, it appears surprising to me that some of the easily grown fibres of India should not have been employed as substitutes for flax. This is probably owing to the fibres being sent by the natives in a roughly prepared state to market. For there is no doubt that the fibre, when ultimately divided, is fine and also strong enough, as we may see in this specimen of the Wuckoo fibre, from Travancore, and was formerly seen in the fibres prepared by Mr. Dickson. This is still more conspicuous in the fibres which have been prepared by Mr. Pye, and which I gave him a few days ago in the rough state in which they were sent from India. The red bast from Pegu has been converted into a good fibre, and we see a part has been bleached and is almost white.

Mr. Pye's other specimens were, he informs me, prepared from the commercial Bombay hemp; I hope Mr. North will give us some information respecting this process.

Besides these, there is another set of fibres, which I will not particularise, for they are too numerous, but they are remarkable for length, softness, and silkiness; indeed, in many respects, they resemble fine jute, but they are usually stronger. These belong chiefly to the genus Hibiscus, some of which are cultivated on account of their edible fruit. Several have been sent from Assam, others from Chota Nagpore, and Sambhulpore, from Bijnour and from the Deyran valley. The Urena, from Pegu, but a weed in most parts of India, yields a soft jute-like fibre, which, as well as another from Tenasserim, may be used for flax. Others have been sent from the opposite coast of India, that is, from Canara, whence, we have seen, a fine kind of hemp is produced. Some of these are well worthy of cultivation. Dr. Roxburgh, 50 years ago, recommended *Hibiscus strictus* for cultivation, on account of the quantity and fineness of the fibre it yielded. So also *Abroma augusta*, which he was disposed to call Perennial Indian Flax. These specimens are still in the India House collection, and fresh ones have been sent recently from Assam. The bast abounds with long, strong, and white silky fibres. The plant grows so rapidly as to yield two, three, or even four crops of cuttings annually, fit for peeling. He obtained 271 lbs. of clean fibre, which he states was three times greater than the average produce of sunn.

To prove that I do not exaggerate the importance and probable extensive employment of this class of fibres, I have only to refer to some beautifully prepared specimens of some of these fibres, which I gave to Mr. Malcolmson, of Portlaw, and which he has returned me within these few days.

Though I prefaced these observations by stating that I would not enter too much into detail or dwell upon a very large number of plants, yet, as most of those to which I have referred are the produce of the richer soils and moister climates of India, it would be desirable to find something fit to give employment to those who live near the drier and more barren and desert parts of India.

There is fortunately a plant found in great abundance in such parts of India, which requires no culture, can live without water, and abounds in fibre and a milky juice. This, moreover, is a plant with perennial roots, and of which the stems, when cut down, spring up again, and give a fresh crop of fibres. These I formerly brought to your notice, as remarkable for their strength. I now notice them as conspicuous for their fineness, flexibility, and fitness for textile purposes, as may be seen in the sample we have here, of a muslin-like handkerchief, made of the fibres of the *Mudar*, a plant which belongs to a family abounding in fine and strong fibres, and of which we have several specimens in this room. The *Mudar* itself belongs to the *genus Calotropis*, of which there are different species in Sindh, in the West Indies, and in the Madras Peninsula, but all yield this fibre.

With this, however, I will only mention a very remarkable fibre, from its strength and silkiness, which has been sent from Upper Assam, as the produce of *Paderia fœtida*.

The only fibre which remains for me to notice is one that has already been frequently brought to the notice of this Society, and that is the fibre known under the names of China-grass, Chu-Ma, Ramee, Kaloee, Rheea, and Kankhora, which is not only well known in China, but in the province of Assam in India; likewise in the Bengal districts of Rungpore and Dinagepore; in Tenasserim, Siam, Singapore, and Sumatra. Dr. Oxley, writing since my former communication, says it is indigenous all over the Malayan archipelago, grows freely at Singapore, and occurs as a secondary jungle in the greatest profusion in Java; and all that is required is the art of preparation. The Malays have always employed it for their nets and fishing-lines.

Difficulties having been experienced in inducing the natives to grow more of the Rheea fibre than they require for their own fishing-lines, the Court of Directors of the East India Company ordered a few tons to be purchased annually in each district, in order that the natives might, on extending the culture, always find a ready sale for their produce on the spot, or until the quantity should be sufficient to attract the attention of merchants.

In consequence of this order, small consignments of this Rheea fibre have been made from different districts, the quantities of which will no doubt increase yearly. These will also be sold by Messrs. Noble. There have been also sent a few other Rheea fibres, produced by other species of *Urtica* or *Bohœmeria*.

Paper Materials.

Having dwelt so long upon the subject of fibres in general, time and space will allow me to say only a few words respecting their application to paper making. This I the less regret, as having pointed out a mass of valuable material which may be and is actually employed both in India and China for conversion into paper, the subject is one rather for planters, merchants, and manufacturers, than for me to follow up. My attention was first directed to the subject in consequence of the repeated inquiries from paper-makers, and subsequently by an official application from the Board of Trade, to point out any fresh sources of material for the making of paper. India seemed to me, and still does appear, an unworked mine, from which much valuable material might be extracted, and I have no doubt that much will thence be imported, but in this, as in all other cases, we must adopt means suited to the ends we have in view. It has been objected that India is far and freights high, that fibre-made pulp will not draw well through machinery. These objections were as valid when the inquiries were made as they are now. In recommending that Indian fibres should be converted into half stuff for paper makers, I did not intend that the best fibres should be beaten up into pulp before they had been used for other purposes, because I hope that as these fibres can bear examination, and will amply repay any labour that is bestowed upon them, that they will take a higher instead of a lower place in the market. But I specially directed attention to some plants which grow in wild luxuriance, and to others which are cultivated for other purposes, and of which the fibrous part is now yearly thrown away in vast quantities. I believe that if some simple machinery were brought in aid, even of the cheap labour of India, that some of these fibres might be profitably preserved, and that the waste and tow which was obtained during their preparation might be reduced to the state of half-stuff. As an instance of the cost at which this may be done, I would beg to quote Mr. Henley, who has favoured us with a paper on this subject, published in the volume of the Society's *Journal* for 1854.

He there observes:—"It is to India we must look for extensive and cheap supplies, for it is there alone we find the necessary conditions of very low-priced and intelligent labour, with an abundance of elementary suitable materials; and that as articles of small price are particularly sensitive of charges, such as of freight, &c., it is only by large operations that an average of low charges can be accomplished."

Suitable materials being abundant, he proposes that it should be reduced to the state of half-stuff by the aid of the Dhenkee, already mentioned, as an instrument to be found in almost every house in Bengal, being used for husking rice, the preparation of tobacco, of drugs, dye-stuffs, and brick-dust.

The charges to London, including freight, insurance, exchange, dock, and in fact all commercial charges, he estimates at £7 per ton weight. It is necessary to specify the ton weight, as the ton for freight would be only 16 cwt. The cost of half-stuff of different qualities would be about £4 4s. and £7, as contracts could be made at the rate of Rs. 1 8, or 3s., to Rs., 2 8, or 5s., per maund of 82lb., deliverable at any central depôt within a radius of twenty miles. The expenses of conveyance, &c., in India, about £2 2s., and of freight to London, and other expenses, about £7; so that the lower quality might be imported here for £13 4s., and the better quality, equal to linen rags, for £16 5s.

"It would be necessary to have recourse to the usual Indian system of making cash advances to contractors ere a pound of the goods had any existence. Such, however, is the universal system of the country. The natives, it must be admitted, are wonderfully faithful on the whole in adhering to their bargains."

"The method proposes to avail itself at once of their own simple arts; it brings the question as nearly as possible to the state of domestic industry, ever the most economical in such countries; it reduces to the lowest point the charge of collecting from extensive districts the various elementary matters which might present themselves."

I believe, however, that in some parts of India, these expenses might be still further reduced, that is in places still nearer the coast, as, for instance, in Arracan, where excellent basts and ropes made from them are sold in the bazaar of Attyat, for 1r. a maund, or 3s. per cwt. Material is equally abundant in the western coast of the peninsula of India, where, however, water power might easily be applied to the Dhenkee or tilt hammer of India. This would still further reduce the expense, at the same time that the work was effectually done.

Having on a former occasion, as well as in a work on this subject, enumerated the various Indian fibres which may be and are employed for conversion into paper, I need do no more, on the present occasion, than state that specimens of most of them are here. As an instance of the ignorant objections sometimes made, one writer objects to the plantain being employed for the purpose, as he knows, from experience, that the fibre melts away, and is without substance for making into paper. Now if there is one of these fibre papers that is stronger than another, and even parchmenty in character, it is the paper made of plantain fibre. From India fresh specimens of these papers have been sent, as well as some made from fresh sources, as by Mr. Underwood, of Madras, from the fibre of mats, as well as from the fibre of the leaves of *Pandanus odoratissimus*. Captain Dalton has sent from Assam paper made from young bamboos. Mr. Botten some made of the bark of *Daphne cannabinda*, from which Nepal paper is made. We have also some bricks of the half stuff of the same, for which I am indebted to Mr. Henley. Dr. Riddell has sent paper made of the fibres of *Hibiscus esculentus*, one of the plants cultivated on account of its fruit, being used as an article of diet. The plant, he says, is of quick growth and easy of culture, and produces a very strong and serviceable paper.

In this country we had specimens of paper made from the jute of India, of different qualities, and fit for various purposes, by Mr. Hollingworth, of Maidstone. The expence of bleaching he finds to be a very small per centage above the expense of bleaching other materials. Mr. Routledge, I know, has for several years been employed in experiments on making paper from fibres.

I hope he will this evening show us some of the very successful results which he has obtained. The material he employs can, I believe, be obtained as cheaply as any thing else. I have no doubt, however, that if fibres come to be largely employed in making paper, India will participate in the commerce, as her fibres now undersell all others; and though jute is dearer than usual, it is not because smaller quantities have come in, but because it is becoming applied to a number of new textile purposes, but for some of which several of the fibres now before you are equally applicable.

Conclusion.

As we said at the commencement of these observations, it is necessary to connect the producer and the purchaser, and if we want to obtain these fibres in quantity or of good quality, we must address ourselves to local agents, who will make European wants known. For not only must the culture of a new plant succeed, but there must be a *demand on the spot* for the produce. This has been prominently brought forward by several of the Revenue Officers.

Thus, the collector of South Arcot writes:—"I do not believe that anything short of an assurance that a remunerative price will be immediately given, will induce the natives to attempt the cultivation of any novel species of produce." From Tanjore, the collector writes, that "the cultivators have no desire for speculation, and no faith in mere assurances that articles fitted for the European trade will meet with a ready sale at Madras." So in Canara the same officer writes:—In this district, "the Ryots want very little encouragement to cultivate any article beyond a certainty of remuneration. But it is of no use to tell them that any article is of value in a distant market. This is nothing to them. The only question is, if they produce it, will any one give them money for it on the spot, for if any one will, they will produce it immediately." He adds, that he considers the Indian hemp, that which we have already seen, is of such good quality from Canara as to be the most promising article. These officers adduce the fish-oil of the Malabar coast as having become lately an article of export from the Malabar coast. So in South Arcot, the ground nut has come to be largely produced, and its oil exported, in consequence of a remunerative price having been offered by a merchant at Cuddalore. In Rajahmundry and Ganjam, sugar, they mention, as being cultivated in this mode as indigo is in the Cuddapah district.

So Mr. Henley, as we have just seen, recommends dealing with the cultivators by means of native agents, who make advances, and make contracts, and are responsible for the delivery of produce.

The natives of India ought, moreover, to be assisted with machinery suitable for the separation of fibres, and not of a very expensive character, and which might be moved either by hand or bullock power. I may adduce the small cotton gin, the construction of which was superintended by the Commercial Association of Manchester. The natives of India, who would only buy these small machines at first, have since bought about 300 of them, many of them with 10, 20, and 25 saws.

Having thus gone, as briefly as possible, over the extensive field spread before us, I have only to recapitulate the points which seem most worthy of notice. First, that the west coast of the Bay of Bengal, as well as the Peninsula of India, abounds in basts and barks, which are cheap in price, and might be brought as dunnage, if not thought worthy of being converted into fibres or half-stuff. Among cordage materials, besides the brown hemp of Bombay, there are some excellent varieties on the Malabar coast, and in Canara, as well as in other parts of India. The chief point would seem to be to encourage the natives to collect and prepare the fibres as carefully as possible, which there is every probability of their doing, if encouraged by adequate remuneration from the local buyers. The Plantain and other white fibres, are well worthy of forming cordage for ordinary purposes, until they are produced in sufficiently large quantities to make use of them for other purposes. We have also had before us the true hemp, which, though imported from the distant Himalayas, is able to compete in price, as it does in strength, with the hemp of Russia.

Among textile substances, we have seen that there is considerable probability of the successful culture of flax in the Punjab, and perhaps in some other district. But it has appeared very desirable that we should at once make use of some of the indigenous fibres of India which seem well adapted for the purpose, as we have seen the marvellous effects produced by careful preparation on some of these fibres. Those from the west coast seem at once available, while the beautifully prepared and silken fibres of the Hibiscus seem much too valuable to be any longer neglected, and the plants which produce them unite the good qualities of rapid growth, easy cultivation and ready separation of their fibres.

Among the fibres which appear most desirable, from the excellence of their qualities, is that of the Mudar plant, or its nearly-allied species, which abound in desert places, and grow without culture or water, may be yearly cut down, and yearly produces fresh stems. In the qualities of strength and fineness, this seems to come nearest to the China grass, of which, as the Rheea of Assam, we have noticed the imports by several ships, which will probably assist in establishing it as a regular article of import from India, as well as from China.

Most, if not all of those fibres, are fitted for making into paper stuff. Though most of them, from being applicable for cordage or textile purposes, are able to command higher prices than the paper-maker can give, yet some may be brought for such prices as he can afford. Many of them, I feel no doubt, will occupy high places among the imports, as well as among the prices of fibrous materials, and may rival in quantity the jute, which was at one time thought worthless, but which cannot be had in sufficient quantities for our manufactures.

In conclusion, I trust I may refer to an observation I formerly made, and that was, the confident hope that the Collections of Raw Products which were being formed would have considerable effect in diffusing correct information on all such subjects; and I said, that as in the City time was counted in minutes, I would have one in the very heart of the City. I may congratulate the Society on the speedy establishment of a Museum at the India House, which will contain, for permanent examination and constant reference, an ample collection of the Raw Products and Manufactured Articles of the vast Indian empire.

DISCUSSION.

Mr. **Routledge** said that he had great pleasure in complying with the request of Dr. Royle, to show the paper and half stuff he was now manufacturing from a raw fibrous material. These specimens of paper were by no means perfect, and only served to illustrate what may be done with a raw material. At the mills with which he was connected, they were now putting down additional plant, and in the course of a few months they would be in a position to supply half stuff or paper pulp to the trade. The scarcity of paper-making material was a question which had notoriously, for some time past, attracted the attention not only of paper-makers but of all commercial circles, as it was generally admitted that, although the ratio of increase in the manufacture of paper has fully kept pace with that of our two other great staples, iron and cotton, it differs from them in the daily increasing deficiency of supply in its manufacture. The abolition of postal restrictions and the spread of cheap serial publications, had, during the past few years especially, given great impetus to the production of paper. In the 5 years from 1830 to 1834, the annual turn out of paper was 31,423 tons; but in a similar period, from 1849 to 1853, it was 67,515 tons; and in the 2 years 1853 and 1854, it was 79,291 and 79,418 tons. Notwithstanding this increase, he (Mr. Routledge) believed he was correct in stating that the consumption of paper in England, taken according to the population, is considerably less than in other counries; in America, for instance, the consumption is 13lbs. per head per annum; in France, 9lbs.; in Belgium and Holland, 8lbs.; but in England, only 6¾lbs. to 7lbs. The published excise returns hardly gave a fair data for calculation. The price of raw material in France, Belgium and Holland, was much below that in England, as much as from 10 to 15 per cent., and the material was also much better, as in those countries more flax is employed for body linen and clothing than in this country, where cotton is more generally used; in America the price of material is much higher than in this country, the Americans being large buyers of raw material in this market, and their price being consequently enhanced by the cost of carriage. Within the last four years, also, the Austrians had prohibited the exportation of rags; and in France, Holland, and Belgium, the exportation of raw material for paper-making is also prohibited. Three or four years back, the rise of the price of material in this market was as much as 20 to 30 per cent.; this was, however, checked by the late war, and the high value of money since has checked production, but this year the demand is again increasing. He might add, also, that the quality of rag material is much deteriorated, partly from the decreased use of flax for fabrics, such as shirting and women's garments, and partly from the increased demand compelling the paper-maker to admit of an inferior selection of his sample of rags. In his own mill, for instance, where they purchased a low quality of rags, it was no uncommon circumstance for him to see oil-cloth, tarpauling, &c., &c., and there was always a large per centage of woollen rags in the lower assortments, which are thrown out—the better descriptions for shoddy, to mix with the lower qualities of woollen cloths, and for the paper-stainery flock, and the commoner sorts for manure. He believed that one of the first duties which would be remitted so soon as our finances permitted, would be that on paper, and immediately thereafter an immense increase of production would result. Looking to the improbability of any very considerable addition to the supply of raw material through the present channels, and as the high value of land and labour in England act as a practical prohibition to any production here, it was obvious that we must look to foreign countries, and our colonies especially, to meet the necessities of the case. Dr. Royle had, therefore, done the community at large, and our colonies especially, infinite service in directing attention to these valuable and reliable sources of supply, and he (Mr. Routledge) hoped that one main obstacle in the way had now been successfully overcome, which was the treatment of a class of textile plants, which exist in immense abundance throughout India and our colonial possessions generally. The chief staple of food of the negro and labouring population in our West Indian colonies is the fruit of the plaintain, of which a specimen had been kindly furnished by Sir Wm. Hooker, from Kew. When the stem of this plant has fruited, if not cut down it dies away, but generally immediately the fruit is obtained the stem is cut down, and considerable expense incurred in removing it to make way for others. This stem, as would presently be demonstrated, abounds in a fibre of the most valuable description, fitted for all textile purposes; and the tow refuse, or that damaged by imperfect preparation or the voyage to this country, is a most valuable adjunct for the paper-maker, either to use *per se*, or to mix with his present material. At a moderate calculation half a million tons of this valuable fibre were annually wasted, which now might be rendered available by the agency of the extremely simple machine before the meeting, the operation of which would be shown by Mr. Warren, the engineer and manufacturer. The machine was the invention of Mr. Francis Burke, a colonist of Montserrat, and he (Mr. Routledge) considered, from its efficient action, that this problem was now solved. In the year 1838 a patent was taken out by Mr. John Small, for Improvements in Thread or Yarn and Paper from Plantain Fibre, and numerous other patents had subsequently been taken out with the same end in view—some by machinery, others by chemical means. The latter might briefly be dismissed with the remark, that any chemical treatment sufficiently powerful to dissolve or reduce the pulpy matter to a state fit to be separated from the fibre, would seriously injure the latter, even if it could be rendered effectual, which was very doubtful. With reference to the machines, none hitherto had answered the purpose. All the engineers who had gone into the question had endeavoured to imitate the action of the comb or heckle, combined with brushes and scrapers, and these, besides their liability to breakage, required skilful manipulation, which was not to be relied upon in the colonies. The exception to this rule was a machine with which he was connected in the year 1852, which was exhibited at Messrs. Pontifex's. This machine, however, when sent abroad and set to work, was found not to answer—it was extremely costly, very cumbersome (weighing some tons), and the working parts liable to derangement; whereas that of Mr. Burke was simplicity itself, and the fibre was produced in a perfectly clean state, fit for market; as a proof of which he might add that he had been offered, by an eminent fibre broker, £33 per ton for 100 tons or more; and when once introduced in sufficient quantity to attract the attention of consumers, there would be little doubt that the price would advance. Dr. Royle, than whom they could have no better authority, had informed them that the plantain and banana were the cultivated varieties of the *Musa textilis* of the Philippines, from whence they procured the Manilla hemp, which was so much esteemed in this and the American market for ropes and cordage; indeed, the Americans, if they could procure Manilla hemp at anything like a reasonable price, employed it in preference to all other fibre for these purposes. Two years back the finest samples of Manilla hemp sold for £115 per ton. This, perhaps, was an exceptional price, but he was told, on excellent authority that a very high price would be obtained for plantain fibre of good quality. The machine in question would equally treat all the different varieties of endogenous plants. He would not pretend, in this brief notice, to recapitulate the different varieties of plants, as they would be found enumerated in Dr. Royle's work on Fibrous Plants, but would limit himself to the aloe, or *Agave Americana*, the different varieties of yucca, the pineapple, *Phormium tenax*, &c., on which it had been tried, and its action found perfect. All these plants abounded in our colonies, and could be produced at merely a nominal cost to a practically unlimited extent. The machine now exhibited would produce 30 lbs. of clean fibre per diem, and required the attention of a man or boy for feeding, but Mr. Burke had invented a machine which might almost be termed automaton, the working parts, that is the revolving toothed drum and elastic bed were the same, but in front of these were fitted feeding rollers, into which an attendant had only to insert the lanyard or strip of stem, and the same was delivered at the other side with all the pulpy matter or parenchyma detached therefrom, requiring to be thrown into water to dilute the gummy or mucilaginous matter, when it is dried and baled for market. The stem of the plantain, or rather the annular rings, consisted of two descriptions of fibre, the upper, long and strong, the under more soft and silky. In the smaller machine, this was entirely removed by the action of the beater when drawn back, and would require to be subsequently separated from the pulp, when it would sell to the paper-maker; but in the larger machine this lower portion of fibre was retained, when it might be separated by drawing through a coarse heckle or comb. The larger machine would produce 2 cwt. of fibre per diem. Thirty small machines might be driven by a steam-engine of 10 horse-power, and 10 of the larger ones by one of the same power. The samples of paper before the meeting would show the adaptability of the plantain fibre for paper-making. The coarse paper had a portion of New Zealand flax intermixed—of the other two, one was entirely from plantain fibre, the other with an admixture of rag in the proportion of one-third. To resume the paper-making question, in which he (Mr. Routledge) was more immediately concerned, it must be borne in mind that the paper-maker now only used the refuse fibrous products, unfitted for any other manufacturing purposes, such as rags, worn-out canvass and rope, sacking and bagging, tailors' cuttings and refuse, and what might be termed the offal of the spinners and manufactures, the sweepings, in fact, of their mills—the chief of which were cotton, hemp, and flax waste. Paper had also been made from wood, the bark of trees, hop-bine, bean-stalks, sunflower, hay, straw, couch-grass, or twitch. Two or three mills were now using straw pretty extensively, and a mill was now being erected to manufacture paper from twitch, which, however, was no novelty, for in the year 1832, he believed, when the Royal Agricultural Meeting was held at Oxford, Lord Alford presiding, the proceedings were printed upon paper made from twitch or squitch at the mill now in his (Mr. Routledge's) occupation. The paper-maker, in fact, refuses no fibrous refuse (excepting that of wool and silk), being governed in the price he gives by quality, or in other words, adaptability, to his purpose, and the loss incurred in manufacturing the same into paper. It was obvious, from the above brief description of the paper trade, that there is a wide field open for the introduction of any material which will meet the necessities of the case, but to ensure a successful commercial result, two important questions must be determined—first, that the material shall be convertible into paper, or paper pulp, of good quality, at a comparatively trifling expense, and with uniform success; and secondly, that there shall be a certainty of a constant and unvariable supply of this material at a very low price. not liable to fluctuation. He believed these requirements were satisfied in a great measure by the half stuff that he would shortly be in a position to supply; but the plantain, aloe, and similar fibres, were superior in quality, although their cost would be greater. There was, however, a wide field open, and he believed the paper trade would absorb, without difficulty, many thousand tons yearly. The effect would be to reduce the cost of rag material, or at least to induce a better assortment thereof, which would produce the same effect. It now only remained to consider the objections which could be urged against the use of any new fibrous material for paper-making. They are the great difficulty always experienced in inducing manufacturers to adopt new processes, and alter existing appliances at their mills. This was not to be wondered at, considering the great outlay and risk involved in altering machinery and making experiments, which obviously must also materially interfere with the current operations of their business. Moreover, the greater number of paper-mills in this kingdom are worked in a great measure by water power, and being remote from mineral districts, fuel is expensive, rendering steam power costly, and coal for chemical purposes a consideration. And it must be borne in mind that a raw material requires a totally different system of chemical treatment by the paper dealer, to that usually adopted by him for the present rag material, which has, previous to coming into his possession, undergone the process of reduction to a fibrous state and bleaching, before it could be worked into a fabric and printed, and subsequently, while in use, has been to a certain extent further disintegrated by wear and the usual manipulations of the wash-tub. From these various causes there would no doubt be great difficulty in introducing any new raw material generally to the trade, unless it is assimilated in character and facility of treatment to the materials now employed. These remarks would in all probability be made by a maker to whom it was sought to introduce any new material in a raw state, and due consideration must therefore be given to objections (which must not be called prejudices) for which there are good grounds. In Scotland, flax and hemp-waste were now extensively used in paper-making, and the chemical treatment of a raw fibre better understood. These objections did not apply with the same force to a prepared half-stuff, but, on the contrary, there was every inducement for a maker to employ a material which would afford him the following advantages, viz., quality, cheapness, and facility of increasing his output with a positive diminution of outlay. He might add that he had taken out a patent for the treatment and preparation of raw fibres into half-stuff, which applied to the plantain and similar fibres. The prepared half-stuff could be supplied pure and clean, and bleached to any desired standard, and might then be used *per se*, or mixed in any desired proportion with the present materials employed.

In reply to the Chairman,

Mr. Routledge said, he was not sure cocoa fibre could be bleached, but the plantain and many others could be bleached as white as the driven snow. The only descriptions, perhaps, which would not stand it were the jutes. All the hemps would. The machine was adapted for the agave genus as well as for the plantains.

Mr. Warren (presenting a portion of plantain stem, which had been just previously operated upon by the machine) said, it would be observed that the fibre had not been in the least degree broken or injured by the operation of the machine, but was presented entire throughout the length of the piece. With regard to the larger description of machine mentioned, it had been thought desirable to construct one capable of producing greater quantities of fibre. The machine now before the meeting required the attendance of one person, but he saw no reason why (as had been the case with cotton-spinning) the attendance upon each machine might not, hereafter, be greatly reduced. He believed that in the course of a very short time a boy would gain sufficient dexterity from practice to be able to keep two machines going, as only one hand was required in the working of each. Mr. Warren then explained the advantages of the larger machine, describing some of its parts and its principle of action. One peculiar feature of this machine was, that it retained the silky part of the fibre, which in the operation of the smaller one was lost to a great extent. The action of the small machine Mr. Warren described as being rather that of a beater than a squeezer, but the fine fibre, which was of double the value of the other portion, was mixed with the pulpy matter thrown off. In the large machine this was preserved.

Mr. Noble said he was willing to take the fibre in the state in which it was shown to him at £33 per ton in any quantity. He considered the fibre from the small machine as best suited for general purposes, such as rope making, &c.

Mr. Warren, having passed through the machine a piece of the agave, showed that the fibre could be perfectly separated, but that from the variable lengths of the fibre, being shorter at the sides and longer in the middle, in the drawing-back process the short fibres were apt to be lost, passing through with the pulp.

Mr. Ridgway said, at the Great Exhibition of 1851, there were specimens of fibre of the plantain from Demerara, which was stated to be worth about £45 per ton. Mr. Ridgway called attention to a specimen on the table, which he said was wholly prepared in Demerara. Any quantity of that fibre could be produced if they could only procure the labour necessary. Some time ago an advertisement appeared, offering a large premium for the discovery and application of a material as a substitute for rags in the manufacture of paper. Baron de Thierry sent to the Paris Exhibition paper made from fibrous materials from New Zealand. Mr. Ridgway called attention to the lace bark from Jamaica.

Mr. Routledge referred to the *Demerara Gazette*, of June 1st, 1852, in which an advertisement appeared, to the effect that the Guiana Textile Fibre Association, together with most of the eminent residents in the colony, had made a subscription, which was forwarded to him, for the purpose of purchasing a machine at that time, made by Mr. Pontifex; but as that machine did not turn out so well as was expected, nothing was done. He had also a communication from Demerara, which fully confirmed what had been stated by Mr. Ridgway, namely, that plenty of planters were ready to take the matter up, if they could get suitable machinery for the purpose. He had also been furnished with calculations of the cost of production, of carriage to the mill, and all the various particulars. He believed there was a gentleman from Demerara in the room, who could confirm all that had been stated with regard to this question by the planters in that island—if they could only get suitable machinery and insure a regular market for the commodity.

The following is the estimate referred to by Mr. Routledge:—

Assuming Mr. V. der Gon Netscher's calculation of 4,500 stems every two years as a basis, we have 2,250 stems per acre per annum; 74 acres therefore would be required to yield 300 tons of fibre per annum; 560 stems, 80lbs. gross per stem = 44,800lbs., or 20 tons, which at 5 per cent. gives 1 ton of fibre; the 2-cylinder machine will turn out 2 cwt. of fibre per diem.

First Outlay.

10 machines at £100 each	£1000	0	0
12 H. P. high pressure steam-engines	250	0	0
Buildings, sheds, bricks, &c.	500	0	0
Carriage of machinery, and fixing tanks, pipes, connections, &c.	300	0	0
Say for unforeseen expenses	450	0	0
Maximum	£2500	0	0

Analysis of expense per ton fibre.

10 per cent. interest on £2,500	£250	0	0
Rent, management, expenses, &c.	350	0	0
	£600	0	0

Daily proportion of above	£2	0	0
Engineer per diem	0	7	0
Coals for engine, 15 cwt.	0	15	0
3 men attending machines 3s. per diem	0	9	0
6 boys ditto 1s. 6d. ,,	0	9	0
560 stems, carriage to mill	1	10	0
Proportion of cost of cultivation	1	17	6
Packing and expenses royalty	1	2	6
Freight to England £2 0 0	3	10	0
Other expenses 1 10 0			
Total cost per ton	£12	0	0

Mr. Ridgway remarked, that he was agent to an Association in Demerara, which was ready to produce any amount of fibre at a very small cost—next to nothing—if sufficient labour could be obtained. That was the difficulty. The merchants at present confined their attention to sugar and rum. Formerly the colony grew large quantities of cotton, and could do so now, sufficient to supply all the markets or Europe.

Mr. Sharp said, it had not been his intention, when attending the meeting, to have been otherwise than a mere listener. In that character he had listened with attention and pleasure to the able and lucid statements of Dr. Royle. But matter had occurred in the course of the discussion to induce him to say a few words. The lecture had especial reference to East Indian fibres, but the observations were equally applicable to West Indian fibres; indeed, to tropical fibres generally. He (Mr. Sharp) represented a company recently formed, under the title of the Colonial Fibre Company, incorporated by royal charter. The operations of the company were limited, by charter, to the colonies of Jamaica and British Guiana, which alone are capable of producing from 500,000 to 700,000 bales per annum of plantain, besides large quantities of other fibrous plants. Some experiments had been made by a machine in the room. He could offer no opinion upon the action of that machine. He wished the parties interested in it every success. There was ample room for them, and himself, and many others. At the suggestion of the secretary he had much pleasure in placing upon the table a few specimens of various plants as they grew. They consisted of transverse and longitudinal sections of the plantain, the *Agave Americana*, or large American aloe, the *Aloe angustifolia*, the *Aloe variegata*, the *Bromelia penguin*, or wild pine, and one known under the name of silkgrass. The court of directors of this (Mr. Sharp's) company were anxious to satisfy themselves of the practical working of the machinery to be employed in the colonies, and, therefore, instructions were sent out to the correspondents of the company in the West Indies, to forward by every mail-steamer a number of the different plants for experiment. The plantain consisted, as would be seen, of a central portion, the peduncle or fruit stem; but as that stem could not, of itself, sustain the heavy weight of fruit, the support was afforded by means of the concentric rings which surround the central portion, and are merely the petioles or footstalks of the leaves. If the rings were examined, it would be found that the entire outer portion of each constitutes a mass of fibre, the inner portion consisting of mucilaginous matter, which would be removed in obtaining the fibre. The fruit stem, it would be seen, contained a very fine and beautiful fibre, resembling cotton, and capable of being worked with it. It must be observed, that the same machinery which prepared the plantain fibre would not work effectively many of the other plants. For instance, the penguin had a cuticle of so hard and siliceous a character as to require a different mode of treatment; and so with several of the others, rendering modifications of the machinery necessary. Mr. Sharp exhibited specimens of the fibres as prepared, consisting entirely of the products of the plantain. No. 1 was the fibre as obtained from the plant; Nos. 2 and 3 were preparations which assimilated it, in external character, to hemp; Nos. 4 to 7 were various modifications, developing the finer filaments of which the original fibre was composed, giving it somewhat the appearance of flax. The other specimens were the cotton-like material obtained from the fruit stem, and the rougher looking article was derived from the mucilaginous matter removed in separating the fibre. He also showed a piece of rope made from it. He submitted to the meeting another series of specimens, consisting of the produce of many different plants, some of them of great beauty and value, together with some dyed. Some of these specimens were of Indian origin, and he had arranged for an exchange of seeds of such fibrous plants as were indigenous to the east, and not grown in the west, and *vice versa*. He thus hoped to give to each country the advantage of an extended growth. In this arrangement he had been materially aided by Dr. Royle's valuable work on Indian fibres. It might be asked, why he had not exhibited here machinery, or some drawings illustrating it. The answer was short. Those machines were made the subject of patents, and prudential reasons forbade any disclosure of their construction at present. They had been devised, with great care and attention, under the direction of Mr. Benjamin Fothergill and Mr. Charles Beyer, of Manchester. Each machine was capable of producing, in a day of ten hours, from 400lbs. to 500lbs. of fibre, with an expenditure of half a horse-power. Mr. Sharp finally submitted some fibre, which he stated had all the character of the finest flax, and that some of the most experienced flax-spinners of this country had declared it superior to Russian flax, approaching Belgian in quality; and that it was capable of being spun and manufactured into all the fabrics in which foreign flax was employed.

Mr. TRENT said he had expended considerable time and money in bringing machinery to bear upon the manufacture of fibrous plants, and he claimed to be the first to obtain the long fibre from the cocoa-nut husk. He bore testimony to the beautiful manner in which the fibres of the material operated upon that evening had been separated by the machine before them; and, between Mr. Sharp and Mr. Burke, he had no doubt that in a little time they would become quite independent of Russia and all other foreign countries for the supply of fibrous materials. Dr. Royle, Dr. Hooker, and Mr. Henley had done good service in introducing these fibres to their attention. He (Mr. Trent) was now in hopes of something practical being carried out. On visiting Russia, some three or four years ago, he was satisfied, from what he saw there, that in a few years they would have the whole of the export trade in ropes to themselves. He visited two of the principal rope works in that country, and from the extent of plant, and the amount of work going on, he was satisfied that they were making as much rope in those two factories as was made in all London, the whole of which was for exportation. They were using English machinery, which had been in operation there from 20 to 25 years. He believed the Russian manufacture brought better prices in the colonies than the English. As a rope-maker himself, he was ashamed to see some of the descriptions of rope made for exportation. It was of a character to damage their reputation entirely as rope-makers. He had seen some rope made with mere waste, spun into fine yarn. A person sometimes had a three-inch rope that would not bear the strain of a properly-made two-inch rope. He lately attended some experiments with ropes at one of the Royal Dockyards, to test some Irish flax unsteeped against some Russian hemp. They tried some three-inch rope of Irish flax and some three-inch rope of Russian hemp. The Irish flax rope broke at a strain of three tons; the Russian hemp at three tons three cwt. Some rope made from Italian hemp was afterwards tried, and it bore a strain of four and-a-half tons. With regard to the Rheea fibre, he was satisfied that it was adapted to every purpose of rope-making as well as to the finest fabrics. A friend of his in Leeds had told him, that if he could get a sufficient supply of that fibre he should no longer use flax, but that it was not worth while to adapt machinery to the small quantity that was at present attainable.

Mr. WARREN said, that the machine had been found applicable to the cleaning of any description of fibre that had yet been presented to it, even to the hard and dry American aloe, shown that evening.

The CHAIRMAN said, it had been his intention to offer some observations on the subject before them, but time prevented. He would, however, remark that Dr. Royle had proved that whereas, within the memory of men now living, England could only boast of two fibres—or little more—namely, hemp and flax, others had now been introduced to their notice, probably 200, from which they might take their choice, from the longest and coarsest, fit for the strongest cable, to that suited for the finest piece of muslin, to cover the most delicate form. The plantain, the pine-apple, the Hibiscus, the Crotalaria, hemp, and many others, which are either cultivated or grow wild all over India, together with the celebrated Rheea, nettles, and Asclepias, which produce the most delicate fibres for muslins, are equally available for manufacturers who desire to procure them through agencies. In fact, they had an unbounded choice, if they only went after them. It was not to be expected that those within whose sphere these products were available should be acquainted with the mercantile requirements of other countries. The materials themselves, in the various forms in which they were now presented, having been laid before them, and their properties explained, it was for the manufacturers themselves to decide which was the best adapted for their purposes, and to take the means to procure a supply of that which they wanted. The whole of the materials and fabrics now exhibited would be arranged in a museum at the India House, in the course of a short time, for the public benefit, where any manufacturer could form his opinion upon the peculiar desirableness of any particular fibre for any particular fabric, and adapted to any particular machine. Then, through agents employed in India, he could, no doubt, organise a system of supply suited to his purposes. The plantain grew wild on the western Ghauts, from Cape Comorin to 25 degrees of north latitude, millions of stems opening up every monsoon, only to perish unappropriated. In all tropical regions they would find, generally, fibres of a similar character. There had been two great fibres mentioned that night as substitutes for hemp and flax, and they were of the greatest importance—namely, the *Hibiscus cannabinus*, and the *Crotalaria juncea*. He thought that Dr. Royle had proved that he was eminently entitled to the hearty thanks of the Society for the large amount of valuable information he had afforded upon a subject most important to our manufacturers, if they chose to profit by it. He need scarcely invite them to pass a vote of thanks to that gentleman by acclamation.

A vote of thanks was passed to Dr. Royle.

In addition to a very large display of fibres exhibited by Dr. Royle, specimens were shown by Messrs. Sharp, Pye, and Dickson. A machine for preparing the fibre from the plantain and other tropical plants was shown by Mr. Routledge, and worked in the room. Specimens of paper and pulp from some of the fibres exhibited were shown by Mr. Routledge. The Secretary announced that the specimens of fibres, &c., would remain till Saturday, in order that the members and their friends might have an opportunity of examining them.

The Secretary further announced, that on Wednesday the 3rd of December, a paper, by Mr. Christopher Binks would be read, "On some New Methods of Treating Linseed Oil and other Oils, for Improving their Drying Properties in their Application to Paints and Varnishes." On this evening, Henry Blundell, Esq., will preside.

Home Correspondence.

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PAPER-MAKING MATERIALS.

SIR,—I have read with deep interest the article in your *Journal* of the 10th inst., on the "Paper Material" question, by Mr. William Stones, and I forward this communication to you in the hope that one or two interesting points connected with this question, and only briefly referred to in his article, will be found treated of with the greater detail which their importance appears to me to demand.

A manufacture which is instrumental in converting utterly valueless materials into an article not merely identified with all our commercial operations, but an absolute necessity to civilized existence, is entitled to sustain, not only a high rank in the scale of the manufacturing industry of the country, but to be emancipated from those galling restrictions upon its growth and prosperity, in the shape of a fiscal charge of some 30 or 40 per cent. upon the aggregate value of the manufactured article; the oppressive and unjust character of this impost will become at once apparent by considering that on the lowest article of comparative value, (paper used, for instance, in packing sugar) the duty alone is 80 to 90 per cent., and upon the more valuable papers, used for correspondence and the cultivation of the fine arts, the duty is 10 to 15 per cent. It can be clearly shown to impose a very manifest limitation upon the educational resources of the country, as affecting the humbler classes in the shape of cheap newspapers, periodicals, and school books, as also upon those branches of industry of which paper forms, as it were, the raw material. I need scarcely mention paper-staining, a manufacture becoming intimately identified with the domestic comfort and elevation of the working classes, and, by the cultivation of an improving taste, tending to general social improvement.

Soliciting your indulgence for this digression, I may first remark that, the scarcity of material in 1854, inducing the somewhat *equivocal* offer of a reward of £1000 by the *Times* for the discovery of any new material suitable for paper, was in fact artificial. A little inquiry would have sufficed to show, that in the last 25 years, more especially, the supply of raw material has fully kept pace with the demand: one fact will suffice to confirm this statement viz., The paper charged with excise duty in 1836, when the rate was reduced from 3d. to 1½d. per pound, was under 50,000 tons; the present production is 86,000 tons, demonstrating that the increase of population, combined with other incidental sources of supply, have prevented any very serious inconvenience from the want of raw material; and testing the argument pecuniarily (allowing for the artificial prices of commodities immediately succeeding the continental war), it may be mentioned that the rags which in 1818 were commanding £65 per ton, were at the time of the "*Times* panic" selling at £30. I refer to the finest quality of rags, which at all times bears a corresponding value to lower qualities. The application of chemical science, aided by mechanical invention, has contributed to the application of inferior and more abundant materials to the useful purposes of manufacturing printing and news papers, which would otherwise have been applied to the commonest kinds; nor can we fully estimate the beneficial influence produced upon the paper manufacture by the introduction of lucifer matches in substitution for that old-fashioned household necessity, the tinder-box, to which Mr. Stones only briefly alluded. It may be fairly assumed that the supply of rags from private houses has in consequence been increased 40 to 50 per cent. Let us now look at our supply of material under a fair estimate of production, taking the average production from the population arising from the consumption of all fabrics composed of cotton or linen material at 4lbs. per head, we obtain from

28,000,000 of people, say—	56,000 tons.
Imported	10,000 ,,
From the mercantile marine and naval services of the country, rope and canvas ...	20,000 ,,
Cotton waste, 15 per cent. upon a consumption of 38,000 bales per week..............	50,000 ,,
Linen waste	20,000 ,,
	156,000 ,,

To produce 86,000 tons of paper, we have 156,000 tons of raw material, and a further supply of material not enumerated, arising from the consumption of cord of various kinds in packing goods. Millers and other sacks may be added, and my estimate, taken rather below than above the actual fact, gives for the present a suitable supply, the adequacy of which to any present demand cannot be doubted; what may be the future of the paper trade consequent upon the repeal of the duty and the diffusion of education, can only be gathered from a reference to the United States, where national education practically and universally prevails, and where the manufacture of paper (*without any Excise Duty*) is double that of England; and this tends to show that the supply of rags progresses with the growth of population and the development of the paper manufacture. It is true that in America a considerable quantity of the common kinds of paper is manufactured from straw and other vegetable fibres, and that the importation of rags from Hamburgh, but more particularly the Mediterranean, and at times from Great Britain, may reach in value 3 to £400,000 per annum, yet the enormous quantity of printing paper used, and manufactured there from linen and cotton material, demonstrates my proposition of the supply of rags derivable from the population of a country being commensurate with the manufacturing requirements. In 1841 the very large supply of cotton waste, previously used only for very common papers, and for which straw is now the substitute, was applied under my assistance, and is now extensively used for printing papers, as in Europe. Nor must we overlook the circumstance that the rapid growth of the paper manufacture in America has been cotemporaneous with our own, and we see that the investment of capital in this branch of industry has never been retarded by any apprehension of the want of material.

If we look again to France, with a manufacture of 70,000 tons, a restriction existing upon the exportation of rags, and a very rapid extension of the manufacture during the last 25 years, yet the population has supplied the necessary wants of the trade, and prices range much lower than in England.

You will perceive that I concur mainly in the very correct view of Mr. Stones on this subject, and we can now enter more fully upon the circumstances which will justify the introduction of any new material in competition with rags, bearing in mind that the only circumstance that can dispense with the use of rags, will be that a possible reduction in price arising from the introduction of a cheap and abundant material may reduce the price to a minimum which will not compensate for the labour of collecting them. Or, again, that a corresponding costly material may be introduced that will yield a superior texture of paper. These are the two conditions that admit the application of a new material, and the main problem to be solved is the minimum price at which the collection of rags will cease; this I estimate at 1¼d. per pound, taking the average value of all rags collectively, because this price to a manufacturer of paper includes the labour of collecting and the profits of two or three trades; and in the homes of the middle and higher classes, where the rags are the perquisite of the domestics, a very low price, say a half-penny per pound, would not induce the preservation of rags. Again, as a safe proposition, I maintain that the importation of a vegetable production, expressly grown or cultivated for this particular purpose from a foreign country, will not compete with rags. The only material or vegetable substance that will maintain a becoming pretension to adoption must be of domestic growth, and produced incidentally to the growth of a more valuable commodity—as grain, for instance—the straw from which has in most countries occupied the attention of many scientific experimentalists as being the cheapest and the most abundant of any known fibrous vegetable substance; of its abundance, it may be safely asserted, that if the whole of the paper now manufactured were made from straw, it would not absorb two per cent. of the aggregate growth of the United Kingdom. The manipulations that have been during the last ten years advancing, and which are still advancing with a view to demonstrate practically the economy of straw as a raw material, have established a remarkable saving of power to the extent of 70 per cent., as well as the presence of a sort of natural size in straw which, aided by a very economical application of cheap vegetable size, dispenses wholly with the expensive operation of animal size as applied to writing and news papers; but as a sufficiently high degree of quality has not yet been obtained to enable straw paper to assume even a mediocre rank in the scale of prices, the economy of the manufacture has not yet been fully established, but the elaboration of the manufacture, now rapidly progressing, affords abundant promise of such results being effected (notwithstanding the proverbial discouragement, which the paper-dealing trade has manifested towards new improvements), as will render it an instrument for securing that prime necessity of social life, more especially for purposes of education as well as for the extension of the now ridiculously limited export trade of Great Britain, viz., cheap paper the natural result of cheap material.

I am, &c.,

N. N.

October 27, 1856.

BESSEMER IRON.

Sir,—Mr. Gladstone is in error when he asserts that I endeavour to impute improper motives to his friends, the ironmasters. I merely stated the fact, that those gentlemen, in common with many others, from the very natural impulse of self-interest, are extremely averse to change; a circumstance that can excite no surprise, when we reflect that the introduction of more economical processes and operations can be productive of no benefit whatever, in a pecuniary point of view, to themselves. In the present instance, it is calculated that three millions would be saved annually to the nation, if the Bessemer process were to turn out successful; but these millions would not pass into the pockets of the ironmasters, as Mr. Gladstone would appear to insinuate; their profits would remain much the same as they are now; and as the ironmasters are enabled to amass fortunes reckoned by hundreds of thousands, they, at least, cannot have much to complain of.

Those gentlemen are naturally averse to any change which implies trouble or expense, merely for the benefit of the consumer, and will only adopt improvements upon compulsion, by one of their number taking up a new process and underselling the others, or by the ruin of the inventor, as in the case of Henry Cort.

I do not constitute myself the champion of Bessemer's process. It must stand or fall by its own merits alone; but the projector of an improvement is not to be hunted down with impunity in these days of free discussion. There have been projectors in all times, and they have always been made subjects of ridicule; but without the assistance of those gentlemen we should still be clothed with fig-leaves, or in sheepskins, at most. In regard to the present case, I again repeat, without fear of contradiction, that Mr. Bessemer has produced ingots of malleable iron (not forged iron) without the expenditure of either labour or fuel. Let the ironmasters, if they have any wish to prevent animadversion upon their motives, repeat the new process at their own works, and thoroughly test its worth.

Mr. Gladstone speaks of the "forging process," as if Mr. Bessemer's invention was intended to supersede the necessity of that operation; while he, Mr. Gladstone, and every other man who knows anything of iron, is perfectly aware that it is impossible to produce forged iron by any other means than the rolls or the hammer.

I have already disposed of Mr. Hall's munificent offer of trial by wager, through another channel; but I cannot refrain from expressing my surprise, that two gentlemen of such high standing should have attended a lecture upon the Bessemer process at the Royal Polytechnic Institution, where the illustrations must of necessity be on a very small scale, when they could as readily have seen the whole operation performed by the inventor himself; or when Mr. Hall, whose make at the Bloomfield iron works is a thousand tons per week, could have tested the new process upon the largest scale, with little or no inconvenience to the daily routine of such a colossal establishment.

I am, &c.,

HENRY W. REVELEY.

Poole, Dorset, Nov. 23.

BROWN LIME.

Sir,—In reply to Mr. Reveley's letter on "brown lime," I beg to remark that this substance is well known in this country, and is to be found in several places in Wales. It is constantly used as a hydraulic cement by engineers, who are well acquainted with its properties, and also with some of the sources of supply. I believe that used in the Liverpool and Birkenhead Dock Works is obtained in Flintshire. I myself sold a considerable quantity of it to Messrs. Mackenzie, Brassey, and Co., the well-known railway contractors, for the building of the viaduct across the rivers Dee and Ceiriog, on the Shrewsbury and Chester Railway. That supply was obtained from loose boulders on the Berwen range of mountains, just above the village of Llansaintfraidd Glyn Ceiriog. I believe I discovered another very large supply lately on the Kerry-hills, in Montgomeryshire.

It is a very impure limestone, containing much clay in its substance, and to this it owes its peculiar properties. All limestones contain more or less of alumina in their composition, and it is this skeleton of alumina which forms the rottenstone of commerce, after all the calcareous portion has been removed. This removal is effected by nature, by means of some as yet unexplained chemical action, and the hard heavy limestone is converted into a substance as light as cork, and resembling in colour and appearance the brown powder of a ripe puff ball.

Shortly before the death of my lamented friend, the late Professor Johnston, of Durham, I made a tour with him into Wales, in order to examine this curious substance in situ, but unfortunately death prevented the publication of the results of his interesting researches. The rottenstone occurs in large masses on the outskirts of the limestone band in the Brecon Hills, and may be there seen in all its stages of transformation.

In case any of the chemical or geological readers of the *Journal* should feel inclined to take up the subject of the rottenstone, I may say that one of the best places for seeing it with which I am acquainted is about two miles from the "Lamb and Flag" inn, near Ystradgynlais, in the Swansea valley. It is there collected in quantity for exportation to London, and the principal dealer lives close to the "Lamb and Flag."

I may add that the Swansea valley itself is worth a pilgrimage to any lover of grand mountain scenery.

I am, &c.,

JOHN GIRDWOOD.

49, Pall Mall, Nov. 11, 1856.

Proceedings of Institutions.

Crosby Hall Evening-Classes.—Mr. Leone Levi, the professor of banking and commercial law, has been engaged to deliver a course of six lectures on the principles of banking, in Crosby Hall, Bishopsgate-street, before the Young Men's Evening Classes, to commence on the second Tuesday in January. It is probable that Mr. Levi will deliver the same course of lectures before the members of some other literary and scientific institutions in London and the vicinity.

Epsom and Ewell.—The Committee of the Literary and Scientific Institution, in presenting the fifth annual report, express their regret that the expenditure has exceeded the income of the year to the amount of

£21 14s. 10d., two-thirds of which deficiency is attributable to the lectures, but they believe that a little more assistance from the members would relieve them from this difficulty in future, and with this hope of co-operation they have made arrangements for an interesting succession of lectures and lecture-entertainments during the session just commenced. Some additions have been made to the library, and the number of books issued to members has been 717. Although a diminution has taken place in the number of honorary members, the Committee congratulate themselves on the large addition to another class,—the quarterly subscribers—the list at the end of September, 1856, exhibiting an increase of at least one-half more than the number shewn at the corresponding period of 1855.

MACCLESFIELD.—The Twenty-first Anniversary of the Society for Acquiring Useful Knowledge was held on Tuesday the 11th inst., at the Town-hall, the president of the Society, John Brocklehurst, Esq., M.P., in the chair. There was a numerous attendance on the occasion, and among the company present were E. C. Egerton, Esq., M.P., E. W. Wilmott, Esq., and Samuel Greg, Esq. After an address from the president, the secretary read the report, which states that the subscribers, both honorary and ordinary, have increased, and the library has been still further extended, by an addition of about 175 volumes. The classes are still numerously and diligently attended, the reports of the teachers being very satisfactory, and arrangements have been made for re-opening the French class. The Rev. Dr. Newbold kindly gave a lecture on the Coliseum at Rome; and Mr. Walter Montgomery, in May and December, gave two of his Dramatic Recitations. The progress of the Society, since its establishment, has been very considerable. In 1855, it had an income, from all sources, of about £80; a reference library of about 20 volumes, but no circulating library. It had about twelve honorary and ninety ordinary members. Now it has an income of £700, a reference and circulating library of about 3,100 volumes, about 300 honorary and 300 ordinary members, and it has a large and commodious building of its own, with two public news and reading-rooms, and the Government School of Design is accommodated within its walls. E. C. Egerton, Esq., M.P., Samuel Greg, Esq., the Mayor of Macclesfield, the Rev. C. A. J. Smith, J. N. Brocklehurst, Esq., E. W. Wilmott, Esq., the Rev. Alexander Taylor, and other gentlemen then addressed the meeting. In the course of the proceedings the distribution of prizes to students in the classes took place.

MEETINGS FOR THE ENSUING WEEK.

MON. Royal Institution, 2. General Monthly Meeting.
Royal, 4. Anniversary.
Royal Institution, 7. Professor Odling, "On Organic Chemistry."
Architects, 8.
Chemical, 8. I. Dr. Williamson, F.R.S., "On some Reactions in Organic Chemistry." II. Mr. A. G. Anderson, "On the Saponification of Resin."
Entomological, 8.
TUES. Civil Engineers, 8. Mr. T. T. Jopling "On Recent Improvements in Water Meters."
Linnæan, 8.
Pathological, 8.
WED. London Institution, 3. Professor Rymer Jones, "On Vivaria and their Inhabitants."
Society of Arts, 8. Mr. Christopher Binks, "On some New Methods of Treating Linseed Oil and other Oils, for Improving their Drying and other Properties, in their Application to Paints and Varnishes."
Geological, 8. Captain Spratt, F.R.S. and G.S. "On the Freshwater Formations of the Grecian Archipelago." Several Papers on Volcanic Eruptions, Earthquakes, &c.
THURS. London Institution, 7. Dr. R. E. Grant, "On the Natural History of Extinct Animals."
Antiquaries, 8.
Philological, 8.
Photographic, 8.
FRI. Archæological Institution, 4.
SAT. Asiatic, 2.
London Institution, 3. Mr. T. A. Malone, "On Experimental Physics, chiefly in Relation to Chemistry."
Medical, 8.

PATENT LAW AMENDMENT ACT.

APPLICATIONS FOR PATENTS AND PROTECTION ALLOWED.

[*From Gazette, November* 21*st*, 1856.]

Dated 13*th September*, 1856.

2145. John Henry Johnson, 47, Lincoln's-inn-fields—Improvements in firearms. (A communication.)

Dated 19*th September*, 1856.

2200. Archibald Templeton, 7, Skinner-street, and John Lawson, Glasgow—Improvements in the manufacture of pile fabrics.
2206. John Underwood and Frederic Valentine Burt, Fish-street-hill—The manufacture of copying-inks for printing.

Dated 29*th September*, 1856.

2276. Richard Boycott, Blaina, Aberystruth, Monmouth—An improved air-door.

Dated 14*th October*, 1856.

2401. John Knowles, jun., St. Helens, Lancashire—An improved apparatus for the prevention of accidents in winding from mines, which apparatus is also applicable for other similar purposes.

Dated 1*st November*, 1856.

2565. Peter Smith and Thomas Irvine, Liverpool—Improvements in the masts, yards, and rigging of ships.

Dated 4*th November*, 1856.

2582. William King Westly, Leeds—An improved method of and machinery for heckling, combing, drawing, and preparing fibrous substances for spinning.

Dated 5*th November*, 1856.

2592. Andre Jacques Isaac de Montenay du Minhy, Blois, France—Improvements in screw hand presses. (A communication.)
2594. Louis Urion, Nancy, France—Improvements in machinery for the manufacture of matches and match boxes.
2596. Charles Titterton, Roehampton—Improvements in the manufacture of zinc and zinc white.
2598. William Edward Newton, 66, Chancery-lane—Improvements in steam-engines. (A communication.)
2600. Herbert Keeling, King and Queen Iron Works, Rotherhithe—An improvement in rivetting fish joints and other parts in the permanent way of railways.
2602. William Brindley, Moorgate-street—Improvements in the preparation of paper-hangings and other ornamental papers.
2604. John Stanley, 244, Whitechapel-road—Improvements in the construction of, and mode of applying, cranes and other machines to hoisting, suspending, and lowering purposes, also in generating, transmitting, and applying motive power to the same.
2605. William Seed, Preston, Lancashire, and William Ryder, Bolton-le-Moors—Improvements in certain parts of machinery for slubbing and roving cotton and other fibrous materials.
2606. Frederic Holdway, Bayswater—Improvements in the manufacture of candles.
2607. William Blackwell, Settle, Yorkshire—Improvements in ploughs.
2608. Mannor Browne, Strand—Certain improvement in shirts.
2609. George Collier, Halifax—Improvements in drying, stretching and polishing or finishing yarns.

Dated 6*th November*, 1856.

2610. George Henry Stevens, 14, Stafford-row, Pimlico, and Robert Fitch, South Lambeth—Improvements in locking and unlocking jars, bottles, and other vessels, and making such vessels air-tight.
2611. Joseph La Cabra, Albany-street—Improvements in the action of pianofortes.
2612. Colin Hunter, Islandreagh, Antrim, Ireland—Improvements in effecting the operations of drying, heating, and ventilating.
2613. Joseph Parker, Blackburn, Lancashire—Certain improvements in machinery or apparatus for roasting coffee, or for other similar purposes.
2614. William Henry Olley, 2, Brabant-court, Philpot-lane—Improvements in obtaining photographic impressions or pictures of microscopic objects.
2615. James Webster, Birmingham—A new or improved instrument or apparatus for transmitting hydrostatic and pneumatic pressure, which said instrument or apparatus is applicable to pressure-guages, safety valves, thermometers, and other like machines.
2616. Peter Cato, John Miller, jun., and John Audley, Brunswick-dock, Liverpool—Improvements in the manufacture of ships' knees.
2617. Richard Archibald Brooman, 166, Fleet-street—Improvements in the manufacture of cranked axles and shafts. (A communication.)
2618. Frederic Chapman, Piccadilly, and Charles Bowyer, Davies-street—A method of purifying and disinfecting intestines. and manufacturing gelatine therefrom.

Dated 7*th November*, 1856.

2619. Henry Dircks, Moorgate-street—Improvements in the preparation and application of the materials for making worts and washes in brewing, distilling, and like operations, and in the apparatus connected with the same.
2620. Alexander Porecky, Hackney—Improvements in the construction of safety match or lucifer boxes.
2621. Thomas Ollis, jun., Liverpool—Improvements in machinery or apparatus for cutting paper, card-board, mill-board, scale-board, leather, and other substances of a light nature.

2622. William Spence, 50, Chancery-lane—Improvements in apparatus used in the manufacture of silk and other fibrous materials. (A communication.)
2623. Joseph Louis Casartelli, Manchester, and Anthony Casartelli and Louis Casartelli, Liverpool—Certain improved apparatus for ascertaining the density of water in marine steam boilers or generators, for the purpose of preventing saline incrustation.
2625. Louis Joseph Victor Vuitton, Paris—An improved apparatus for consuming smoke.

Dated 8th November, 1856.

2626. James Dickinson, Blackburn—Improvements in machinery or apparatus used in the preparation of cotton or other fibrous substances for spinning.
2627. George Bertram, Edinburgh, and William McNiven, Polton Mill, Lasswade—Improvements in the manufacture of paper.
2628. Lawford Huxtable, 56, Saint Michael's-hill, Bristol—Improvements in pianofortes.
2629. William Porter, 9, Lansdowne-villas, Brompton—Improvements in the grinding of cements and other substances, and in the construction of millstones for the same.
2631. Charles Vaughan, William James Vaughan, and Richard Vaughan, Birmingham—A new or improved strap or band for working stamps, raising weights, and transmitting power generally.
2622. Archibald Reid, Sidmouth-street—Improvements in treating iron, so as to render it impervious to continuous oxidation.
2633. William Morphet, Leeds—Improvements in producing the velvet pile and Witney finish in cloths, and in machinery or apparatus for the same
2635. Jean Baptiste Edouard Victor Alaux, 2, Rue St. Etienne, Bonne Nouvelle, Paris—A lubricating composition.
2636. Thomas Walker, Balderstone, Rochdale—An improved method of lubricating the interior of the cylinders of steam engines for reducing the friction of the pistons thereof.
2637. Richard Archibald Brooman, 166, Fleet-street—Improvements in preserving provisions. (A communication.)
2638. Richard Archibald Brooman, 166, Fleet-street—Improvements in machinery for cutting and dressing stone, marble, and similar materials. (A communication.)

Dated 10th November, 1856.

2639. Henry Bessemer, 4, Queen-street-place—Improvements in the manufacture and treatment of iron, and in the manufacture of steel.
2640. Edwin Thomas Dolby, Stratford-place, Camden-town—Improvements in printing several colours at one time from a single stone, plate, or block.
2641. Andrew Barlow, Shirley, Hants—Improvements in mashing apparatuses.
2642. François Jules Manceaux and Eugene Napoleon Vieillard, Paris—An improvement in breech-loading fire-arms and ordnance.
2643. William Stones, Greenhithe—An improved mode of sizing paper.
2644. Peter Gaskell, Sculcoates, Kingston-upon-Hull—The admission of steam into the cylinders of steam engines by an equilibrium valve.
2645. James Somerville, Glasgow—Improvements in weaving.
2646. John Henry Johnson, 47, Lincoln's-inn-fields—Improvements in apparatus for printing electro-telegraphic despatches. (A communication.)
2647. Richard Pearcy, Manchester—Improvements in machinery or apparatus for giving additional cohesiveness and torsion to fibrous substances in the drawing and other processes.

Dated 11th November, 1856.

2648. William Smith, 10, Salisbury-street, Adelphi—Improvements in machinery for sewing cloth and other materials. (A communication.)
2649. John Fell Jones, Birmingham—Improvements in the manufacture of rollers or cylinders for printing fabrics, and in machinery to be used in manufacturing the said rollers or cylinders.
2650. William Clark, 53, Chancery-lane—Improvements in the manufacture of barytes and strontian, and their salts, and in their application to various purposes. (A communication.)
2651. Richard Archibald Brooman, 166, Fleet-street—Improvements in the manufacture of boots and shoes, and other like articles. (A communication.)
2652. James Leadbetter, Leeds—Improved means of obtaining motive power.
2653. Francis Frederick Clossman, 16A, Park-lane—Obtaining alcohol from certain substances not hitherto used for that purpose. (A communication.)
2654. Paul Rapsey Hodge, 4, Albion-grove, Barnsbury-park—Improvements in the manufacture of felted cloth. (A communication.)
2655. Hugh Baines, Manchester—Improved machinery or apparatus to be applied to hoisting and other lifting machines.
2656. John Henry Johnson, 47, Lincoln's-inn-fields—Improvements in projectiles. (A communication.)
2657. Julian Bernard, the Albany, Piccadilly—Improvements in the manufacture or production of boots and shoes, or coverings for the feet, and in the machinery or apparatus employed in such manufacture.

Dated 12th November, 1856.

2659. William Lukyn, senr., Broad-street, Nottingham—A buffer break for railway carriages or trucks attached to locomotive engines, whether one or more engines, for the conveyance of goods or passengers.
2661. William Weild, Manchester—Improvements in machinery for doubling, twisting, and winding yarns or threads on to bobbins or spools.
2663. Henry Collett, 12, Grosvenor-street, St. Peter's-street, Islington—Improvements in machinery for mowing and reaping.
2665. Arthur Maw, Broseley, Salop—An improved mode of constructing the eccentrics or cams of steam engines and other machinery.
2667. Jean Charles Boulay, 34, Rue des Bernardins, Paris—An improved method of printing in various colours simultaneously.
2669. Richard Archibald Brooman, 166, Fleet street—A new or improved felted fabric. (A communication.)
2671. William Green, junr., and Thomas Storey, Framwell Gate Colliery, near Durham—Improvements in machinery or apparatus for washing or cleaning coal.

Dated 13th November, 1856.

2673. Thomas Wright Gardener Treeby, 1, Westbourne-terrace-villas, Westbourne-terrace North—Forming sewers or tunnels, and gulleys to sewers.
2675. Alexander Hutton, Ardwick, near Manchester—An improved warming apparatus, applicable to railway and road carriages, and other useful purposes.
2677. Samuel Newington, Ticehurst, Sussex—Improvements in dibbling apparatus.
2679. William Francis and James Hooper, 88, Leadenhall-street—Improvements in tanning and dyeing leather, linen, cotton, wool, hair, and silk, and fabrics composed of any of these substances.

INVENTION WITH COMPLETE SPECIFICATION FILED.

2720. William Healy, 118, Dorset-street, Salisbury-square—Improvements in furnaces and boilers and hot water apparatus for heating purposes.—18th November, 1856.

WEEKLY LIST OF PATENTS SEALED.

Sealed November 21st, 1856.

1244. William Illingworth.
1250. Benj. Nadault de Buffon.
1277. Oldham Whittaker and Cyrus Wallwork.
1281. William Carr Hutton.
1285. Adolphe Bonvallet.
1321. Raymond Fletcher and Edwin Fletcher.
1325. Thomas Morris.
1418. Edouard Guérin.
1707. William Astbury Jump.
1972. George James Farmer.
2021. Hezekiah Conant.
2125. Richard Atkinson Coward.
2139. George Hutchison.
2180. George Davies.
2218. William Taylor.

Sealed November 25th.

1260. Samuel Newington.
1270. Lemuel D. Owen.
1274. Charles Herbert Holt.
1298. Thomas Wilson.
1300. Stephen Rossin Parkhurst.
1304. Augustin Marie Herland.
1324. Joseph Briggs.
1328. William Potts.
1352. Thomas Chambers, jun.
1382. William Wilson.
1552. James Fleming, jun.
1592. William Colborne Cambridge.
1856. Thomas Evans, jun.
1938. Henry Bessemer.
2102. Charles Brook, jun.
2124. Pier Alberto Balestrini.
2250. Robert Frost.

Patents on which the Third Year's Stamp Duty has been Paid

November 17th.

2679. William Taylor.
2683. Patrick Benignus O'Neill.
2684. John Harcourt Brown.
2625. Emanuel Wharton.
2714. Frederick Levick and Joseph Fieldhouse.
2808. George Collier.

November 18th.

2689. Auguste Castets.
2691. William Austin.
2716. Charles Ramsay.

November 20th.

2706. William Joyce and Thomas Meacham.
2740. Daniel Lancaster Banks.
2800. James Reilly.

November 21st.

2619. Benjamin Burleigh.
2729. John Drumgoole Brady.
2737. Samuel Cunliffe Lister.
2745. William Leigh Brook and Charles Brook, jun.
2747. John Henry Johnson.

November 22nd.

2723. John Hill, sen., and John Hill, jun.

WEEKLY LIST OF DESIGNS FOR ARTICLES OF UTILITY REGISTERED.

No. in the Register.	Date of Registration.	Title.	Proprietors' Name.	Address.
3906	Nov. 20.	Clover Leaf Consolidator, and Wire-worm Exterminator or Clod-crusher	John Large	Upton, Berks.
3907	,, 21.	A Jointed Stay for Casement Windows, Doors, &c.	Abercrombie and Son	19, John-st. Tottenham-court-road.

Journal of the Society of Arts.

FRIDAY, DECEMBER 5, 1856.

HONORARY LOCAL SECRETARY.

The following gentleman has been appointed Honorary Local Secretary for Newcastle-upon-Tyne and its neighbourhood:—

Dr. Thomas Richardson.

THIRD ORDINARY MEETING.

Wednesday, Dec. 3, 1856.

The Third Ordinary Meeting of the One Hundred and Third Session was held on Wednesday, the 3d inst., Henry Blundell, Esq., in the chair.

The following Candidates were balloted for, and duly elected members of the Society:—

Adams, George G.
Anderton, Arthur
Andrews, Charles James
Auckland, John Tattersall
Baines, Edward
Beale, Thomas Frederick
Bell, G. M.
Benson, James William
Brooke, Charles, M.A., F.R.S.
Burrows, R. W.
Challis, Alderman, M.P.
Chrimes, Richard
Clarke, Frederick James
Clarke, Rev. Charles
Cockrell, Rev. G. C.
Cotterell, Thomas
Craske, R.
Cubley, Wm. Harold
Darbishire, Samuel Dukinfield
Darlington, John
Dickens, Alfred Lamerte
Dixon, E. J. J.
Edmondson, George
Farrance, George John
Fandel, Henry
Foster, A. B.
Fry, Henry Laurence
Galton, Capt. Douglas
Godwin, George, F.R.S.
Goodfellow, Thomas
Gordon, Robert
Guest, John
Gundry, Joseph
Gurney, John Henry, M.P.
Hanbury, Daniel
Harrison, J. Fortescue
Heeley, Edmund
Henderson, Thomas W.
Hess, Ralph
Heywood, Sharpe
Hoare, Deane John
Hopkinson, John
Hudson, William
Hunter, John Lawes
Jennings, Richard
Jessop, Sidney
Keats, Frederick
Laird, John
Lawson, John
Leaf, Charles John
Lister, John
Mace, John Ellis
Major, Rev. J. A.
McKie, H.
Mercer, John
Mitchell, Rev. W.
Muir, William
Ohren, Magnus
O'Reilly, Montagu Frederic
Owen, Rev. John Butterworth
Porter, John Thomas Brown
Powis, Major the Hon. Henry Littleton
Pye, George
Radcliff, Joshua
Ratcliff, Charles
Reeves, Charles
Reichenbach, William
Robertson, Andrew
Samuelson, Barnard
Schaeffer, Chevalier Ignatius de
Sim, Alexander
Slight, Frederick
Sommerville, William
Spottiswoode, Wm., F.R.S.
Springfield, Osborn
Staples, John
Stebbing, Rev. Henry, D.D., F.R.S.
Stevenson, George Wilson
Taylor, James
Tuke, James Hack
Vaughan, ———
Wetter, Conrad
Wheatley, E. B.
Wood, Frederick, M.R.C.S.

The following School has been taken into Union since the last announcement:—

Oxford House (Chelsea) School.

The Paper read was:—

ON SOME NEW METHODS OF TREATING LINSEED OIL AND OTHER DRYING OILS, FOR IMPROVING THEIR DRYING PROPERTIES IN THEIR APPLICATION IN PAINTS AND VARNISHES.

By Christopher Binks.

I.—*The Question and the Problem.*

At the time—now some years ago—when the investigations were first entered upon, the results of which are this evening submitted to the consideration of this Society, there was to be found nowhere any accurate history of the peculiar chemical changes the drying oils undergo in the act, on mere exposure to atmospheric air, of passing from a fluid to a solid state; in other words, in the act of drying. Neither was there to be found on record any correct or systematised examination of the reactions to which such oils are subjected when, under the multifarious conditions brought about by their admixture with other materials to form paints and varnishes, they are brought into contact with matters whose presence may be supposed to influence, that is, facilitate, impede, or in some way modify, their drying properties. Much less was there to be discovered any satisfactory or reliable chemical explanations of the *modus operandi* of the various plans and modes of treatment of such oils then and still in use, for giving to them drying properties superior to those pertaining to them in their normal condition.

The oil of the linseed is taken as a type of this class; and, from its vast commercial importance, it is to the treatment of this oil, in order to adapt it to the multifarious uses it is put to, or is required for, were it so adapted, that of all those oils the efforts of the chemist should be chiefly devoted. It will be understood, therefore, that throughout this paper, unless where specially indicated to the contrary, it is linseed oil (its properties and treatment) that is always referred to.

The chemistry of the changes of this oil induced on mere exposure to air, and involved in its solidification, as that chemistry has existed up to this time, may be summed up as being recorded in the stereotyped formula that the oil dries, that is, passes from a fluid to a solid state merely by absorption of oxygen from the atmosphere; therefore, to aid it in its drying, or by some preliminary treatment to facilitate the ultimate result, it was conceived to be necessary only to heat it along with certain metallic oxides, which, previously to its exposure to air, should give it oxygen, and thereby shorten the time needed afterwards for a more complete absorption. Hence the theory, but erroneous one, of the utility of the addition to the heated oil, under the ancient mode of treating it, of litharge or protoxide of lead, and hence, more recently, the super-addition to that of red lead, and subsequently (originating with the French) of the anhydrous peroxide of manganese. The oldest practice was merely to heat or boil the oil. Then followed the conjoint employment of litharge, both of which were purely empirical, founded on no chemical principle whatever. But the more recent ones, of super-adding red lead, or peroxide of manganese, were, as just stated, founded on the principle of giving to the oil, at a high temperature, the proportion of oxygen needed to initiate its drying. Along with these later practices there has, still more recently, crept in the conjoint employment with the lead oxides of the acetate of lead, of sulphate of zinc, and sometimes of the mineral *umber*, this last being used with a view still more completely to impart to the oil the deep brown colour deemed essential to it when transformed into the condition of good "boiled oil."

The principle at the root of all these practices is the old one (so old that its origin must be sought for among the labours of, probably, the Dutch chemists of the last century), of—as it is called—"boiling" the oil, that is, by subjecting it to the action of a very high temperature, to effect its partial decomposition, or a partial or incipient destructive distillation of it, and to aid such decomposition by applying to it one or other, or all, of the materials just referred to, these being selected variously and capriciously, and, as far as the writer has ever been able to discover, without there existing among the operators the most remote notion of the real mode of action. The practice has always been, and still remains, a purely empirical one. This, then, is the practice—that of boiling linseed oil to make it dry—that has so long, and still (with but one or two exceptions, to be hereafter mentioned) universally exists in England. In most large towns or manufacturing localities, as in London, in Hull, in Liverpool, in Leeds, in Newcastle-upon-Tyne, and in Bristol, exists one or more oil-boiling establishments, where in some huge boiler, holding a few pipes or tons, is placed the oil, along with the modicum of litharge and other materials; and a strong heat from a fire, acting externally, is applied till the oil is "boiled;" and this boiled oil constitutes the great bulk of the drying oil, whose innumerable uses and applications meet us at every step and everywhere, and for which, notwithstanding its intrinsic defects, the demand is universal and immense.

The gentleman who this evening presides over this Society, eminent as well for his manufacturing and commercial enterprise as for his scientific acquirements, is himself one of the largest (if not the largest) manufacturer of this oil in the world; but even were these operations conducted everywhere with the same care, and skill, and results that are to be found and are obtained at the works of Messrs. Blundell, Spence, and Co., of Hull, there would still exist, as there now does, an urgent and universal demand, created by the vast advances in art and art manufactures in every other direction, for something better and beyond this—for finer and for a greater variety of drying oils, for better rates of drying, better colour, or greater varieties of colour, and different degrees of limpidity or viscidity, to fit the various tangible but indescribable requirements of the artist and the operator, for better methods of producing them, and for the kind of labour to these ends with which this paper is concerned.

Linseed oil appears in four different forms, from one or other of which the manufacturer, the varnish maker, the painter, and the artist, must, each for himself, select it, according to his special requirements. These kinds are—1st, the oil in its natural state, as it comes from the seed, and called *raw* oil; 2ndly, this raw oil *refined*, or from which has been separated its mucilage and colouring matter; 3rdly, the raw oil *boiled*, that is, made or intended to be made more drying than the original oil; and 4thly, the raw oil put into the variety of conditions as to thickness, colour, and rate of drying that, in comparatively small quantities, is to be found among the varnish makers, the artists' colour dealers, and others.

The oils of the artist class, it may at once be remarked, have generally more the character of curiosities than of utilities, and result from the fondling and nursing of a gallon or two of the oil over many weeks or months, sometimes exposing it to air or sunshine, sometimes treating it with acetate of lead, or with litharge, &c. Each artists' colour-maker has probably his own special mode of treatment, and not unfrequently the artist himself prepares his own oil by some favourite method. The result is generally that such specially prepared oils are by no means remarkable for their drying properties; and the strongest the writer has met with he found to consist chemically of a solution, in any excess of oil, of the oleate of lead, and it had obviously been made by heating raw oil along with litharge and water, and afterwards expelling by heat the *excess* of water used. This kind dried *per se* in 15 hours.

The writer has carefully sought for and examined the kinds of alleged quick-drying linseed oils to be found in the artists' colour-shops in London, and has found them almost invariably to be mere rescripts of the old formula, producing their effects, such as they are, through the medium of the action of the old, or variations of the old, preparations of lead.

The varnish-maker who (when not content with well-settled, *i.e.*, old raw oil long exposed to air and light, nor content with refined or boiled,) would preliminarily treat his own linseed oil to get rid of the mucilage and the colouring matter, sometimes treats the oil, cold or warm, with acetate or protoxides of lead, then sometimes separates all lead by sulphuric acid; sometimes he warms the oil along with sulphate of zinc or some salt of alumina, or applies to it chlorine or some chlorine compound, &c. But the issue of the whole is, that the varnish-maker still requires something better, that is, an oil unchangeable in colour, under the high temperature, needed to dissolve the copal and other gums he has to mix with it, and that after all shall remain a fine drying oil, and as free from colour as possible; this problem, the varnish-maker has not yet solved to his entire satisfaction.

The *refined* oil, in paint-making, is employed chiefly as the vehicle in which to grind the white pigments. The *raw* oil is used to thin and prepare for use the finer kinds of paints, from which *boiled* oil is excluded by its dark colour and after-effects. The raw oil is of itself a very slow drier. The refined is still more imperfect in this respect—and hence, to quicken the work of the operative painter, arises the necessity for using, along with these two, spirits of turpentine or the compositions called driers. Could the raw, or, still better, the refined, be made of themselves to dry with sufficient rapidity, or rather, could a fine drying oil, of an equally fine colour, be obtained, there would then be no need for turpentine as a drier (it would be used to produce certain art effects only) nor for driers nor for boiled oil.

It is necessary to examine in some detail the existing process of boiling, and its results. The oil to be thus "boiled," as it is called, is placed in copper, or boiler plate, or sometimes in cast-iron pans, of greater or lesser capacity, according to the magnitude of the works; and this capacity may be that of one pipe of oil, or of four or six, or eight pipes. On an average, they hold four to five pipes, or about two tons of the oil. Along with the oil is mixed so many pounds of litharge, of red lead, and of sulphate of zinc; sometimes of acetate (sugar) of lead, and umber, or other matters, according to the peculiar notions of the "boiler," so-called, *par excellence*, from the generally long experience such functionary has had in such work, or in the establishment he is attached to. He is generally some old and valued servant, pre-eminent alike for faithfulness to the interests of his employers, and devotedness to the antiquated secrets of his craft. He is the very model of some old, honest, and enthusiastic alchymist, reduced to the inglorious proportions of a modern operative on wages, who roasts linseed oil, that he may unwittingly destroy any valuable property it possesses, but which would remain unaffected, would he only deal with it more gently and tenderly.

To the bottom of the pan, so charged, is applied a fire, and the oil, with its contents, gradually raised to a high temperature. There is first thrown off some water, held combined probably with the mucilage in the oil, and this water forms a yellow-stained froth upon the surface of the gradually heating oil. As the heat increases, there are thrown off, successively, acetic acid, acroleine, and other vapours and gases, that give to this oil-boiling operation its distinctive but disgusting accompaniments, and make it needful that such establishments should be exiled beyond the limits of refined or civilised habitations or existences,—in London, to take refuge in Rotherhithe, on Bow-common, or in the Isle of Dogs; in Hull, in Wincolmlee or at Sculcoates; and in Liverpool or Leeds, in some similar locality and association, where, in close juxta-position with operations on a large scale for manufacturing resin oil, for refining fish oils, distilling coal tar, bone-boiling and grinding, and the preparation of nameless manures, it is hoped that any process of olfactory analysis of the issuing abominations may fail in detecting those that especially belong to this boiling of oil. And even in such exile, the rest they enjoy is but an uneasy one, under the eye of some sanitary official, urged into zeal by some rival interest, or by the real or imaginary spread of chemical knowledge in the community.

It is needless to say here, that on the lands of the highest class of houses, where there is at hand every needful appliance, and is ever exercised a most careful regard for public interests, these boiling arrangements are so made as to minimise and place below nuisance point the exterior evils of such a process; but wherever the oil is so treated, the occurrence to a greater or less extent of these nauseous emanations is inevitable.

Before the heat so applied to the pan has fulfilled its work upon the oil, the temperature of the oil has risen to some 600 or 700 degrees of Fahrenheit. Finally, it has suffered the changes peculiar to its incipient or partial destructive distillation, and passed from the bright yellow colour of the raw oil into a deep and permanent reddish-brown colour; and the more intense this dark colour, the better is the boiling considered to have been accomplished. Upon an average, about ten or twelve hours are occupied, from the first application of the fire, till the oil is in a condition to be still further cooled and transferred to the settling or store vats, whence, after some days, the clear oil is decanted from the sediment (called "foots"), and is in a state to be sent out as boiled oil.

And what is the cost of this operation—of the materials—the fuel and labour used—and what the ultimate value of the clear oil and of these "foots?" What the drying rate and extent of the application of this dark-coloured oil so obtained? And is there no other method of giving to linseed oil the same or more perfect drying and other properties than those realised by an operation so antiquated and impotent?

The clear oil so obtained, even when from the very best makers, always contains a considerable quantity of lead, is dark coloured—almost black, and does not, on exposure to air, materially bleach. It either, under the most favourable conditions, develops, on drying and exposure, a dirty yellow or yellowish brown colour, or it blackens, through reactions between the lead in it and sulphuretted hydrogen. In paint-work, its original dark colour limits its application to coloured paints. From all whites, and the more delicate tints of all interior decorations and artists' work, it either is, or should be, absolutely excluded. Its rate of drying, *per se*, is, on an average of the best kinds, 15 hours; but, more generally, when taken from the smaller makers, or from the shops, this ranges between 24 hours and 60 hours, and, too frequently, it does never properly dry.

But the process is an evidently dangerous one, as the application of a naked fire to vessels containing such inflammable matters must always be, and the fire risk in such establishments is proportional. It is an intolerable and daily increasing nuisance, both from fire risk and from smells; whilst the giving, by this treatment, increased drying powers to the oil is never certain. It ends as often, in some hands, in utterly spoiling the oil as it does in improving it. The gradually increasing importation, stimulated by the late war, into the market of linseed oils obtained, not as of old, from the Baltic, but from East India seed, has introduced into the old process a new element of uncertainty and of probable loss. The difference of climate or of culture gives to the Baltic and to the East India seed oil so different a character, as to require and call for an entirely new mode of chemical treatment, not only in giving it increased drying properties, but in refining and otherwise applying it. This East India seed oil is what is called "tender." It cannot be "boiled," that is, incipiently decomposed by heat, with safety. It, moreover, contains, besides the oil of the linseed, other oils, such as that of the dodder seed, and others not prevalent in the north of Europe, and which are non-drying under the old treatment; and hence has arisen a conviction in the minds of such firms as those of Messrs. Earls and Carter, of Liverpool, where the writer experimented especially upon these oils, that, on the grounds of this change in the character of the oils in the market, as well as upon other grounds, some modification or total change from the old modes, both of refining and of drying, should be sought for. The Messrs. Sissons, Bros., of Hull, not long ago informed the writer that a large batch of linseed oil, containing a large admixture of East India seed oil, which they wanted to boil in the usual manner, had so frothed up and swollen upon the application of the heat, that a large quantity overflowed through an outlet safety-pipe, and was wasted, whilst the remainder was so thick, and otherwise spoilt, as to be unfit to be applied to any ordinary purpose. As these gentlemen remarked, a repetition of such accidents as these, though in their large establishment of no moment, would be of serious importance to the smaller houses.

Involved in these topics is a question of health, now prominently before the public, viz., the lamentable diseases and life-shortenings entailed upon the operatives in lead and the preparations of lead, among which preparations must necessarily be classed the kind of oil we are now speaking of. For a principal element of modern paints, viz., the carbonate of lead (white lead), there is now proposed to be substituted another substratum, viz., oxide of zinc (white zinc), and hence has arisen a contingent necessity, if we thus shall banish preparations of lead from the pigment, to banish lead also from the usual vehicle—the drying linseed oil. The vehicle so used should not, if we would follow up this movement fully, be itself, as it now is, and has always been, because of the lead in the boiled oil, the most immediate agent of those evils thus sought to be avoided. Manganesed oil, that is, the deep red coloured oil, or boiled oil, made by *boiling* linseed oil with peroxide of mhanganese, which I alluded to before, is, both because of its deep staining colour, and of its imperfect drying properties, virtually useless to this end. Oxide of zinc, *per se*, possesses no drying properties whatever; therefore, its mixture with merely raw or refined linseed oil does not result in a drying compound.

All kinds of existing "driers" contain and depend upon lead for their drying powers. How then is this projected substitution of zinc for lead to be aided by any method that, without lead, shall dry the paints so composed, or give to the vehicle the rate of drying that is practically essential. Should it be one of the results of these researches, fully (as it really is, and is submitted to this Society to be) to have solved this problem, the writer conceives that this will not prove to this Society the least interesting part of his labours. He would, however, remark that the perfect innocuousness of oxide of zinc on animal life, has yet to be fully demonstrated; and the gradually increasing development of this branch of manufacture will speedily show this. It is however due, meantime, to say, that whilst the hideous and time-detested evils of lead are indisputable, nothing has yet transpired similarly criminative of zinc.

But a movement of this kind will not be aided by overlaying its evidences. As to the evils alleged to be inflicted on the inhabitants of dwelling-houses that are, or have recently been, painted with lead-compounded paints, worked with lead-impregnated oil (this "boiled" oil), or dried by addition of lead-compounded driers, it is only proper to say, that they (that is, the imputed evils) are not due to the lead in this case. There is no emanation of lead from the freshly-painted walls that can be inhaled, or that otherwise can come in contact with the persons of the inhabitants. It is to the *turpen-*

tine used to thin, and to aid in drying, and which, being highly volatile, and carrying with it (not lead, but) certain products of the decomposition of the oil, that otherwise would go on imperceptibly and innocuously, impregnates the air of the apartments, and is inhaled, that the head-aches, the dyspepsia, and the indefinable sense of disorder, discomfort, and depression, in a newly-painted house, are chiefly due. Here, to the inhabitants merely, there is brought about no actual contact with the lead. Those who actually *handle* the paint are the persons who suffer—the operative painter, and the operative manufacturer of the lead pigments, of the lead-compounded driers, and of the boiled oil.

The scientific vigilance of the French Government takes care to propagate everywhere such knowledge, bearing upon the physical welfare of its people, as chemistry or physiology may bring to its notice; and, among the rest, they encourage in every way the spreading abroad among the operatives a knowledge of the sad evils entailed upon them by handling and working with pigments, paints, and other preparations containing *lead*. And the writer has just been told, by one well conversant with Parisian proceedings of this kind, that the Government will now admit of no contract for public works for paints that contain lead. That, although prohibitively to restrict the use of these is beyond the sphere of an Imperial decree, by proceedings so significant as this of their contracts, they instruct and intimate the importance they attach to the subject.

The oil-boiling trade in England is divided chiefly between two classes:—the paint manufactures and grinders, who boil oil for their own use and for their own sale, and the oil boilers and refiners, who receive from the oil merchants and from consumers—not themselves boilers—the raw oil, put it through the operation, and return it at a certain charge per ton. Those of the former class, generally, in every respect, persons of high character and position, have obviously every motive of interest, had they none other, to do their work well; but those of the latter class (with many most honourable exceptions) have so conducted the business as to reduce it to a most disreputable position. By some of these the oil sent them is sometimes never boiled at all. It is coloured in some way, and returned at a charge of from 30s. to 40s. per ton. In other cases, a hundred weight or two of the genuine raw oil is abstracted, and its place supplied with an equal weight of common resin. In others, the abominable addition is made to it of a quantity of resin oil. If it be known to be for export, and the chances are against any examination before departure, any description of refuse stuff, in no other way saleable or usable, will be mixed with the genuine oil; and in due time, some victim, in one of our remote colonies, finds the paint it has cost him so much money and care to provide never dries; very pleasingly, of course, convincing him of the improving moralities of the mother country. The practical evils of such a system are met with daily and everywhere.

To relieve a wealthy and most important class of persons from this abominable system, by providing them (each for himself, if he wish) with the means of treating their own oil on their own premises, saving both carriage, boiling charge, and the chance of deception, and producing oil of any colour and quality that may be required, is another of the practical results of the researches this paper is intended to submit to the Society.

This, then, is the problem—to take the raw oil, and by some process, free from danger, fulfilling its objects at an ordinary temperature, or, at most, under a steam heat, free from noxious or unpleasant accompaniments, simple, cheap, and expeditious—to give to the raw oil an efficient rate of drying property that can be modified at pleasure; to give to it any colour, ranging between the dark brown of the old boiled and the straw colour of the refined, or a better, if that be possible; to give to it any required degree of limpidity or viscidity that will fit the multifarious requirements of the manufacturer and artist; and to accomplish this at pleasure, with or without the adjunct of preparations of lead, thereby either to meet such requirements as the old habit and style of oils may still perpetuate, or to meet the growing convictions that a more harmless class of paints and paint materials should be adopted.

II.—*Review of Known Resources for Solution.*

For the pure chemistry of the oils and of fatty matters it is needless here to say, that the chemical world was, and is still, indebted chiefly to the researches of Chevreul, undertaken and completed some forty years ago; and that it is singular how completely these researches and their results have both fixed the character of this branch of chemistry, and either precluded or obviated subsequent inquiry. But the labours of Chevreul went to determine their chemical constitution, not to investigate their peculiar changes under all kinds of extraneous action; and the peculiar chemical history of the changes the drying oils undergo under the various conditions here concerned, formed no part of his admirable researches. Both the manufacturing and the chemical world have, in this case, seemed content to accept as a sufficient explanation that of the oxygen absorption, without thinking that this fact might be only one of many actions simultaneously at work, or of a series of complicated changes, each of importance, and requiring to be studied before the subject could be understood, and this understanding be brought to bear upon any processes for improving industrially this branch of manufacture. The more modern organic chemistry, with its accurate manipulations, and the blaze of light it has and will yet throw upon this and kindred subjects of inquiry, has hitherto in its brief career had too many other objects to be devoted to, or so few real workers to undertake them, as to have passed over almost entirely this mere section of so large a field. The result has been that this question of the phenomena involved in the drying of oils had not yet passed through the ordeal of the minute and complete examination modern organic chemistry was capable of effecting, and consequently there had been made no inroad upon either the old theories, or upon the facilities of testing the oils in order to improve their drying properties, that the daily and vast importance of the subject would seem to have merited.

The existing practice, that has been described above, is itself of course older than the comparatively more recent alleged explanation of its chemistry. It is older than the time of Scheele and the epoch of the chemical philosophy of Lavoisier; for oxygen and its reactions, real or supposed, in the case, were not known or recognized for so long a time as litharge and its reactions upon oil have been. But both the practice and its chemical explanation are sufficiently antiquated to have led to the hope that the application to the phenomena of this branch of industrial chemistry, of the laws and appliances of modern organic chemistry, would surely result (as in so many other instances) in throwing some light upon, or in giving a truer and more satisfactory interpretation of, the chemistry involved in them.

But mere analysis did not furnish the information sought for. The expression, in correct formulæ of the composition of the linseed oil, in its original normal condition, as obtained from the seed, and a similarly accurate expression of its composition, when it had became solidified, threw no light whatever upon changes whose intermediate character, or the character of the series of results intermediate between the normal and final condition of the oil, were probably as important to the end in view as the original and the final conditions themselves were.

Analysis, therefore, would not, and did not, supply the required information, and a totally different line of experimental research was demanded.

But, amidst such a multitude of phenomena, that must surely be presented, if only sought for, among the almost infinite number of mixtures, in daily use, of linseed oil with other substances, are there not already existing, and to be discovered, without the making of special experiments, such reactions, or indications of reactions, as shall give, in the apparently complicated subject, the crucial direction sought for? What kind of paints, with linseed oil as the vehicle, *dry* the soonest of themselves? What kind of substances used as the pigment are thus found to *retard* the drying of the oil? What the chemical actions to be discovered in the peculiar mixtures of materials that the operative painter has, in all times, been using to act as *driers*, each operative, as is well known, having for himself some favourite specific of this kind? What the *modus operandi* of the mixtures, springing originally out of those operative painters' empirical trials, that are now so generally manufactured and sold as *driers?* What is there in these that begets a specific action so singular as the addition to paints of only some very small per-centage of these, results in the paint so treated, drying in from 12 to 18 hours, whilst, without such addition, the same paint may not dry in from 60 to 70 hours? How explain all this—or how can such mixtures be made to develop any chemical facts that may serve to throw light on the subject?

An analytical examination of those mixtures showed that the foundation of the whole was the oxide of lead,—litharge. That in the most potent kinds there was also acetate of lead, mixed variously with sulphate of zinc, sometimes with red lead superadded as the active agents, united with sulphate of baryta, with carbonate of lime, sometimes with caustic lime or with sulphate of lime, as the non-active and bulk-making elements, added in some cases to modify the action of the others, but most frequently to give weight and profit. These, in various proportions and ground up with linseed oil, raw or boiled, in a peculiar order of addition (the peculiar effect of which these researches hereafter explain), constitute the driers of the shops of the present day.

But the result of an examination of those, founded on analysis, developed only the fact of the agency, in some unexplained mode, of the same agents that had always been employed to give such potency as can be given to the drying power of the oil when boiled. It was but the ringing of the changes upon the old materials, and the old method of reasoning; but in the issue of which (that is, in those driers) mere empiricism had, in the usual way of accident, developed better and more active effects. There was still no satisfactory clue to the real cause of the specific action upon the oil of these mixtures, nor, consequently, any light thrown through which to devise better and less objectionable modes, than that of drying paint through the medium of these compounds, or of giving to the oil itself better drying and other essential properties than those obtained by the ancient and most objectionable method of *boiling* it.

III.—*Method Chosen for Solution.*

The course adopted was that of multiplying experiments under conditions so completely comprehended and at command, that the effect of each element of the trial should be apparent at first view. It was the simple plan of bringing into contact with linseed oil every conceivable material, and watching carefully the results, viz., the issues of reactions, as seen or expressed in the one simple result of the oil drying, or being impeded in its drying, under the specific action of each material; to take every material that chemistry can supply, and casting aside for the time all mere theorizing, whether the old doctrine of oxygen absorption, or any other, to rely solely upon the inevitable though slow issue of trial, narrowly watching the results. Surely out of such a course of experimenting, some phenomena will issue that shall give the crucial indications sought for?

To test the drying rate of an oil, or of an oil mixed with some pigment or material to dry it, it is simply necessary to spread it upon the surface of glass, and expose it to the atmosphere, and to note the time occupied in its passing from its fluid to a solid state, or in drying; and the circumstance that on its being touched with the finger, it neither adheres to it on removal, nor resists its removal (that is, not being "tacky"), is taken as evidence of its being dry. It is needless to say that even this simple method involves the necessity for some precautions, always, in one shape or another, due to accurate experimenting. The oils, in comparative trials, must be spread out of a uniform thickness, or the same weights or measures spread over an equal area, and each must be placed in exactly the same conditions as to temperature, exposure to light, and to currents of air, &c. The drying rate of an oil is materially affected by temperature—the hygrometric condition of the atmosphere, by its state as to stillness or motion, and by the presence or absence of sunlight, &c. An oil that in a warm, breezy summer's day will dry in 8 or 10 hours, may not dry in less than 16 or 20 when the air is foggy and motionless; and in an unfavourable winter's day may not dry in less than from 24 to 30 hours. But in all after-reference to drying rates, it will be understood that those stated are obtained under average circumstances, as with the temperature of the air at 60° Fahr., &c. But with regard to these and similar minute details that these experiments have required, however essential and interesting to the experimenter himself, it would be altogether out of place, and beyond the patience of this Society, to do more than thus merely allude to them; but this method of testing, it will be understood, is that adopted and referred to throughout this paper whenever the drying rate *per se* of any oil is mentioned, that is, its rate of drying when tried alone and unmixed with any other substance. When wished to test its drying, not *per se*, as in the case just stated, but under conditions of a more extended exposure to air, brought about by its mixture with some material not itself acting chemically, but mechanically, then this further condition of the test is obtained by grinding the oil up with oxide of zinc for a white, and with lamp black for a black, on glass as before. When so mixed there comes into play other actions and effects, to be hereafter more particularly referred to.

The first series of experiments was occupied with the oil in its normal condition, and with which there was mixed nothing but the material whose specific action or effects (if any) upon its drying properties was to be determined; and this specific action was sought for under two several conditions as to temperature; the first under the ordinary temperature of the atmosphere, (that is, the ordinary conditions that oil in the form of paint or varnish is subjected to) and the second under conditions of the application to the oil, along with the several matters added to it, of higher and various degrees of heat.

The immediate issues of both series of experiments were sufficiently curious and interesting; but it would be trespassing too far upon the indulgence and patience of this audience to recapitulate other than the main results,

Along with 100 parts of the oil were ground up (using a slab and muller of glass) respectively 5, 10, 15, and 20 parts of the substance whose action upon it was to be found out, and these mixtures, spread by a camel's hair pencil upon plates of glass (non-absorbent) and the time of drying of the oil, (or the length of time during which it did not dry, when that negative result followed,) together with any special appearances, and the attendant hygrometric condition and temperature of the atmosphere duly noted.

In this manner were successively applied to the oil such substances as the various oxides and salts of tin, those of antimony, of copper, of arsenic, of zinc, of lead, of cobalt, of nickel, of manganese, of tungsten, and numerous others. There were also applied alumina, lime, soda, potash, magnesia, sulphur, ammonia, and their salts of every variety, and varied in every way by using them (both these and the former) in their dry (*i. e.* anhydrous state) and with their constitutional water and their water of crystallization in every instance on which they assumed or were capable of being placed in these different chemical conditions. In like manner, moreover, was the oil submitted to the action of iodine, of bromine, of chlorine, of cyanogen, of sulphurous acid gas, and the gaseous oxides of nitrogen, and others, and also, of course, to the more readily obtained action of the hydrated acids, the acetic, the sulphuric, the oxalic, the hydrochloric, and the nitric.

Experiments so ordered were multiplied into hundreds; and the first conspicuous results were to reduce to only a mere few the materials that out of all these had any specific action at all of the kind here sought for or desired, viz., a drying action, unaccompanied by any other action that precluded the application of the agent so effecting it to the purpose in view. The result is indeed finally (as will be seen afterwards) to reduce this number practically to two or three, because these peculiar actions, fitted exactly, and better than any others previously employed, all the requirements in drying oil in its various applications; and the next conspicuous result was to show that such of the above substances as did exercise this specific action, were equally effective when either the smaller or the larger proportion was used, that is, the oil dried as well under the action of the 5 parts to the 100, as under the 10, the 15, or the 20 parts, and that, therefore, this action was not of a kind belonging to that class of chemical actions depending upon reactions between elements in equivalent quantities, but of some other and yet undetermined kind.

This series of experiments was followed by another, in which, instead of using the several chemical substances alone, a variety of compounds, mutually reacting with each other, were mixed together along with the oil, and their mutual or contingent reactions upon the oil clearly noted; and it was out of this latter series that there came finally the processes which it is more especially the object of this paper to submit to your attention, and that, in the judgment of the writer, are destined to act in future so important a part, both in improving the processes to be applied, to the treatment of these oils, and because of the extraordinary results in the qualities and varieties of the oils so obtained, in thus extending the sphere of the application of drying oils.

Another long series of experiments, (still conducted on the same general principle of searching, by multiplied trials, and out of the consequent multifarious results, for new or crucial phenomena), had for its object to discover how results obtained under the former series, when the materials whose specific action upon the oil was investigated, *per se*, were modified, when, in addition to the drying compound, or the compound whose drying or contrary action was to be determined, there was mixed with the oil some material intended to bring the mixture into the condition of an ordinary paint, so far as regarded the relative proportion of the oil and of the pigment; and the pigments chosen for this purpose, to mix with the oil, or along with any other experimental material added to it, were as already mentioned, the oxide of zinc and lamp-black, used, of course, separately and comparatively.

To this series was added another, intended to determine the character and amount of action of another kind that the former series had given traces of, viz., the purely mechanical action (not chemical) caused by materials mixed with the oil, mutually reacting among themselves, and, in so reacting, giving birth to a molecular action or disturbance of the oil, and thus causing it continually, during such action, to present fresh surfaces of the oil to the action of the air. An oil so mixed and subjected dries much sooner than one not so agitated or disturbed; and to watch under the microscope, and determine the amount of this action or influence, and the kinds of mixtures that best produce it, constitutes by no means the least interesting of the curious phenomena developed in the course of these experiments.

IV.—*Results and Deductions.*

Confining a brief summary of results to the main object in view, those suggestive of the manufacturing operations to be adopted, and omitting a variety of instructive and curious phenomena thrown out in the course of so much experimenting—such, for example, as the peculiar texture of paints, or surface appearances when dry, produced by unusual mixtures of materials; the various degrees of "gloss," and of "flat," unexpectedly developed, and suggestive of new modes of producing these effects; the curious phenomena of molecular disturbances, already alluded to, when watched under the microscope, and yielding curious art effects, that an artist, provided with sufficient chemistry and his microscope, and who would penetrate into some of the inmost recesses of the chemico-mechanism of his craft, might convert into a study of infinite interest and utility; omitting indications of the pure chemistry of the successive changes in the oil, yet to be thoroughly determined, and expressed in accurate formulæ—omitting these, and many others, the summary of practical results may be given briefly as follows:—

When an oil, or an oil paint, on exposure to air, dries, four distinct kinds of action come into play, to effect, or to contribute to, that result. These are—

Firstly.—The chemical actions taking place naturally (and unaided by any other contingent action) between the oil and the atmosphere, and atmospheric influences, or the *natural* chemical action consequent on exposure.

Secondly.—Those due to some specific chemical action upon the oil of some element in the pigment, or of some element added to it specially to initiate or aid the action that follows upon exposure, or the *induced* chemical action, as contra-distinguished from the natural.

Thirdly.—Those due to the peculiar physical *structure* of the composition of the paint, through which, within the same superficial area, a larger surface of the oil is brought under the action of atmospheric agencies.

Fourthly.—Purely *mechanical* actions, brought about by molecular disturbances in the oil or paint, by which fresh particles of the oil or fresh surfaces of it are being, during the time of exposure, continually thrown up to the action of the atmosphere, by which the atmosphere is admitted interstitially as well as superficially to act upon the oil. These molecular disturbances are caused by the admixture with the paint of some volatile fluid, as turpentine, and its evaporation;—by the escape of water of crystallization of some salt or other added to it; or by chemical re-action and combinations taking place between the elements of the pigment, or between it and some other, or between some other elements added, and resulting in the formation of some new compound, or in some act of crystallisation or other changes of form; and often in the liberation of previously combined water, &c., &c. The materials whose re-actions yield those purely mechanical actions are, of course, such as do not, of themselves, act chemically upon the oil, but act simply by creating in it a movement of its particles during the time of exposure of the paint for the purpose of drying it.

In any instance of an oil or a paint drying, the influences at play to contribute to that result can be traced to one or other, but most frequently to the combined effect of two, or of all of those kinds of actions.

If a given weight of any drying oil be spread in a thin film over a given area—say 100 square inches—it may dry in (say) 20 hours, under the natural chemical action of atmospheric exposure and influences.

If oil of the same kind and weight be ground up to the consistency of an ordinary paint, with some material not acting chemically upon it (as the half-vitrified anhydrous oxide of zinc), and this mixture be spread over the same area, the oil will dry sooner than in the former instance, probably in 18 hours; and this result is due to an increased area of exposure of the same weight of oil, consequent upon interstitial action of the mixture; that is, each particle of oxide of zinc is enveloped in a globule of the oil, and the consistency of the mixture is such that the air finds its way into the mass as well as merely upon its surface, as when the oil is used only *per se.* This is the third kind of action, or that due to *structure.*

Still using the same kind of oil and area of exposure, if a composition be exposed to dry, consisting of three-fourths by weight of the oil, and one-fourth of turpentine plus the oxide of zinc, this will dry in a time considerably shorter than either the first or the last, because the evaporation of the turpentine adds an element of mechanical disturbance, and because that, over the same area of exposure to superficial and interstitial action, there is *less* oil to react with the atmosphere, and its reaction resulting in the drying of it, is concluded in a shorter time, which will probably be about fifteen hours.

If with the oil, plus the oxide of zinc, there be mixed, in equivalent proportions, some acetate of baryta and crystallised sulphate of zinc, the oil in this mixture will dry sooner than that *per se*, and probably about the same time as the last, that is, in fifteen hours; not through any chemical action, for they exercise none upon the oil, but because of the molecular disturbance caused by the combining of the two salts, and the throwing of some portion of the water of crystallisation present.

Again, if with the oil there be ground up, to form the paint, sulphate of baryta, and to that be added some crystallised sulphate of manganese, this, too, will dry somewhat sooner than the oil *per se*, because this salt, being efflorescent, and parting with three of its equivalents of water, throws off those on exposure, although the salt itself (that is, the sulphate of manganese *per se*) has no action whatever upon the oil at common temperatures.

Now, these examples of various actions will sufficiently indicate the kinds referred to under the third and fourth heads; but the most important are the *induced* actions (the second kinds), that is, those which, through some special addition to or treatment of the oil, advance its drying rate both beyond its *natural* and beyond its *mechanically*-produced rates.

Now, the practical results of this long course of experimenting were, first, the discovery of certain materials or forms of materials never previously so used, that exercise specific drying actions upon the oil. Next, to show how very few of all those resorted to experimentally exercise any drying action at all. Then to reduce even these few to two or three, whose properties fully admit of their use for all practical purposes; and finally, to demonstrate what the kind of action really is that thus issues in the solidification of the oil.

It was discovered that the *hydrated protoxides* of certain metals pre-eminently exercise a specific drying action on the oil. That it proceeds in the *cold* with sufficient rapidity to render the aid of heat not necessary, though the application of heat quickens, and is expedient in the operation. The hydrated protoxides of iron, of nickel, of cobalt, and of manganese, are the most remarkable of the class; but it is through the latter (*i.e.*, the *hydrated protoxide of manganese*) that all the singular and happy effects upon the oil are to be practically accomplished.

Linseed oil in its normal condition—*raw* oil—does not dry *per se* under 50 hours. In this, its normal state, it appears (as it may be expressed) to exercise a certain power of resistance against external influences, that would tend to disturb its equilibrium, and transform it from the fluid to the solid state. It yields to these influences only after a few days' struggle, as it were. Now the hydrated protoxides, just mentioned, by mere contact with the oil in very minute proportional quantities, at once break through this state of equilibrium, or power of resistance, and the oil thereupon begins at once to dry; that is, this contact *initiates* the action or series of actions, or removes some obstruction against their exercise, and these then proceed with all the rapidity that unimpeded external or internal influences are capable of. This peculiar action of these hydrated oxides is analogous to, but by no means chemically identical with, that of *fermentation*, that with saccharine matter is *initiated* by addition, in minute quantity, of the fermenting agent, and which then, without further addition, proceeds to completion. The addition to the oil of only from 3 to 5 parts of the hydrated protoxide of manganese to 1,000 of the oil, gives birth to these peculiar changes; and by the simplest of methods of after treatment, this chemical fact is made applicable to the production of any required kind of drying oil.

It is scarcely necessary to remark that this *hydrated protoxide* is, in every respect—in its mode of application, action, and results—different from the old *peroxide*, which at ordinary temperatures exercises no action whatever upon oil. Whilst the latter is used to *give* oxygen to the oil, the property of the former is to *abstract* it. The protoxide is a powerful deoxidising agent; and had the writer been guided by the old theory of *giving* oxygen to the oil, the hydrated protoxide would never have been tried, nor, probably, these curious results obtained. The manganese protoxide is selected out of the others having a similar specific action, because of the peculiar property it alone has, conjointly with its powerful drying action, of *bleaching* the oil finally. The iron oxide gives to the oil a permanent brown stain; the cobalt, a reddish; the nickel, a greenish tinge; and the manganese oxide is readily and cheaply obtained through the medium of the beautiful rose-coloured salt, the crystallised sulphate of manganese.

V.—*Manufacturing Arrangements and Products.*

The arrangements for manufacturing the drying oils on this principle that, under the writer's direction, have been adopted by the well-known firm of Messrs. J. and W. Wilson, of Liverpool, will fully explain the process of manufacture. A large wooden and lead-lined vat, holding several tons of oil, is furnished with a false bottom or compartment, through which steam is passed to warm the oil; and with a contrivance for passing into the oil a large volume of atmospheric air, sent into it by a double-action air-pump, attached (capable of being thrown in or out of action at pleasure) to the main shaft of their grinding mills machinery. The oil, used in very large quantity at a time, is mixed with hydrated protoxide of manganese, or materials yielding that, in quantity ranging between 5 and 14 lbs. to the ton, and the oil warmed up to from 100 to 150 degs. Fah. In a very short time—10 or 20 minutes—the oil loses its peculiar yellow colour, passing through a greenish into a brownish tint, whilst the oxide disappears, being dissolved in the oil. In this state of "solution," as it is called, the oil has already had given to it, by this simple, rapid, and inexpensive operation, a very considerable amount of drying power, and is fit, in this state, to be applied to a multitude of purposes. If, at this stage, the operation be stopped, and the oil left to cool, it will let fall a very small quantity of reddish-brown deposit, the result of a combination between the manganese oxide and the colouring matter of the oil, whilst throughout the oil is diffused an oleate of the oxide of manganese, giving it the brownish tinge. On exposure of this "solution" to air, this tinge, in the first instance, passes into a deep brown, as deep as that of common boiled oil; then there follows a deposit of sesqui-oxide of manganese, and the oil begins to *bleach*, and gradually, as those changes go on, increases in its drying rate. The extent to which the bleaching may finally proceed, may be to produce an oil equal, or better, in colour, than *refined* linseed; or it may terminate in producing a fine amber-coloured oil, these results being influenced by the quantity of the manganese employed. These are the effects of exposure to air after formation of the "solution." With small quantities of oil they will be completed in a few hours; with larger quantities —tons—they require two or three days, when it is only the action of the air upon the *surface* of these quantities that is brought to bear upon the oil. But if the air, by any mechanical means, be forced into the oil in abundance, when slightly warmed, say to 100 degrees Fahrenheit, and thus be brought in contact with every particle of it, these changes are then accomplished with singular rapidity. A few gallons will pass through all those changes, and be finished in from half-an-hour to one hour. A few tons require only from four to six hours to be thus converted into fine-drying, or into bleached, or refined drying oil, requiring only, after this, to be left at rest, for subsidence of the insignificant deposits before-mentioned; or, to have these separated immediately, and the oil is at once fit for use or sale. If, after accomplishment of these changes and the bleaching effects, and separation of all deposits consequent upon them, the oil be further subjected to the action of air by surface exposure, or by the blowing apparatus, it gradually thickens, that is, it passes from its fluid towards its solid form, and can have given to it any degree of viscidity ranging between that of refined linseed and that of honey, in fact, it may, in this manner, be almost solidified,—effects, it is needless to say, of no small value for a variety of purposes.

If, in place of specially and previously preparing the hydrated protoxide, as assumed so far to have been done, one of its salts be taken, preferably the sulphate of manganese, and this be mixed direct with the oil, along with some other compound capable of decomposing the sulphate, and of liberating, whilst in contact with the oil, and under its *nascent* conditions, the hydrated oxide, then there come into play operations and effects of great value and convenience. The agent of decomposition of the sulphate, in this case, may be lime, or magnesia, or ammonia, &c., but the most readily manageable, and which yields the most powerful of the drying oils for all common purposes, is the hydrated protoxide of lead, or the anhydrous protoxide, with water used along with it, or used simply when the manganese sulphate has in it its water of crystallisation. These operations, as will be apparent to any chemist, admit of a great variety of modifications, and of the use of many different materials. For the sulphate may be substituted the chloride—the nitrate or the acetate of manganese, &c.

With the hydrated protoxide of lead and the manganese sulphate as the elements, there is, of course, the formation of sulphate of lead, and this yields a large deposit from the oil at the end of the changes. But the mixture thus obtained is itself one of the best as a drier (for coloured paints, &c.) that can be found.

The final effect of the passing into the oil large volumes of air, after that has been contained for some time, is to increase the weight of the oil. Before it becomes, in this way, too viscid for common use, it is found to have had added to its weight from 2 to 3 per cent. There is, therefore, no loss, but a gain, by this operation. The original cost of materials needed to produce the most powerful oil does not exceed 3s. to 4s. per ton; but every particle of these, as subsequently recovered after the process, is of equal or greater value than the original cost. The cost of a few hours of steam warming the oil, and of attendance, is very trifling; so that the process fully meets all the requirements of the manufacturer on the score of its extreme economy.

The Messrs. Wilson (who, besides being paint and colour manufacturers, are extensive ship and house painters, probably the largest ship painters in England, and requiring, consequently, both large quantities and many varieties of drying oils) conduct these new oil operations on a very large scale, on their new premises in Orford-street, Liverpool, and find themselves delivered from troublesome dealings with oil boilers; produce, with perfect convenience, any quantity they require for their own use, and receive back, in one useful form or another, every particle of oil they subject to these operations.

I cannot close this paper without expressing the obligations these new processes lie under, alike to another gentleman—Mr. Thomas Hubbuck, of London, and to the Messrs. Wilson, for the congenial encouragement given to them during the transition period—that is, during their journey across that debateable ground that always intervenes, in chemical researches and applications, between the laboratory and the manufactory.

DISCUSSION.

Mr. Thos. Wilson, of the firm of Messrs. Wilson, of Liverpool, writes thus:—"I may say I have never had one single complaint of our oil not drying; and I think the best I can say to show that we approve of your method is, that we have put down a new apparatus, more than double the size of the old one, and we now do between four and five tons at a time, and have never had a drop of oil boiled on the old principle since we adopted your plan, now nearly eighteen months ago. We grind the materials together in oil, and add the water when we make each lot. I have now nearly a ton of material ground, so that I do not require to give it much attention, as our man now knows the quantity."

Mr. Varley said, nothing had been stated in the paper with regard to the action of drying oil upon the pigment white-lead, which, properly prepared, he considered was the whitest pigment known. He wished to know how the water was extracted from the oil?

Mr. Laing said, in an experience of thirty years he had found nothing so good as pure linseed oil, and he had adopted the process of throwing in litharge, which carried down the mucilaginous matters containing the water. Practically he found litharge had that effect, and at the same time did not produce any injury to the oil itself.

Mr. Hanhart said he wished to ask Mr. Binks whether he considered that, in the mode of boiling or heating oils by which they acquire drying properties, and are thickened without the addition of any metallic oxide, the change was entirely owing to the absorption of oxygen from the atmosphere, or whether it might not be partially owing to the decomposition of the oil, and the numerous reactions that took place when the temperature was considerably raised? Could the oil rendered drying by Mr. Binks's process be made of the necessary consistence for lithographic purposes? There was a great objection to the use of driers in the manufacture of lithographic varnish, for although it was necessary it should dry when on the impression, yet, owing to the absorbent nature of the leather rollers, they would soon become hard and perfectly useless. Any process that could supply a perfectly colourless varnish from pure linseed oil (or any other oil that had the proper printing qualities) would be a boon to the manufacturer of printing inks, especially for chromo-lithography, where the dark colour that linseed oil acquired when brought to a high temperature was very objectionable, as it spoiled the purity of the delicate tints.

Mr. Thomas Hubbuck remarked that he had seen samples of the oil prepared by Mr. Binks before the process was perfected, and he must say, that the specimens which he saw in the first instance were very crude, as compared with those now in the room. Some of them were dark, and others perfectly white, but there was a varnish smoothness about them all, different from what was usually seen, none of the watery particles being left. He did not know how they evaporated, but such was the case, and the water was completely taken out of the oil.

In the treatment of linseed oil, the opposite of the common process of refining appeared to be required. The usual process was by acids, which were afterwards blown off by steam, and there was always a considerable portion of water remaining, even in the transparent and clear oils. But the oil prepared by Mr. Binks's process was perfectly anhydrous, no particle of water remaining in it. The drying properties of the oil depended upon the will of the operator. His experiments had not gone to the extent stated by Mr. Binks—that quantity had nothing to do with it; for he (Mr. Hubbuck) had found that the power of the oil to dry was in proportion to the quantity of ingredients he put in. It might be made to dry in six or eight hours, or, if desirable, in half that time. The experiments he had made had never been sufficiently accurate to give him the means of knowing on what that depended, and he had never produced any oil so limpid and crystal as that now exhibited. He had used it with snow white, and his experience did not agree with the opinion expressed that evening, that sulphate of lead was the whitest pigment known, because snow-white (the white oxide of zinc) threw the sulphate of lead into the back-ground in respect of whiteness, and with that he had produced a colour applicable to mastic varnish. Mr. Hubbuck added that he had no doubt as to the value of Mr. Binks's process.

Mr. HEYWOOD said, he had oxidised linseed oil under pressure of oxygen gas of two atmospheres, so as to bring it almost to a solid state, and without the use of the oxide of manganese. If nitrate of baryta were used, the oil would be destroyed, and combustion produced. The oil might also be dried by atmospheric air under pressure. Mr. Heywood stated that oil of turpentine might be oxidised in the same manner as oil by means of air, but never without the pressure of atmospheric air. If Mr. Binks's experiments had been carried on in vessels from which the atmospheric air was excluded, he might think that the air had nothing to do with it; but he considered the process one of oxidation.

Dr. LONGSTAFF said he was sure the Society could not but feel obliged to Mr. Binks for having brought this very interesting subject before them; especially for having detailed the elaborate series of experiments which he had gone through with a view to arrive at some practical result. He could not, however, but regret the tone of depreciation in which he had spoken of the old and the existing processes. He thought it was to be regretted that in bringing forward matter which he conceived to be important in theory or practice, he should introduce that matter by running down every other theory and every other practice; and he (Dr. Longstaff) felt, as one deeply concerned in this subject,—being connected with one of the largest manufactories of this article,—he felt it due, not only to his own firm, but also to other firms who had long been engaged in the practice of producing boiled oil, to enter his protest against the epithet applied to them and the art they practised. They had been told that the practice was not only unsuccessfully pursued, but that to the present day it was empirical: nay, more, that it was impotent and uncertain. He most distinctly and emphatically contradicted these assertions. He considered that the practice of boiling oil, as it was now carried on, by those most conversant with the subject, was not empirical; that it was founded on a series of experiments conducted with as much care, and with as much scientific knowledge, as those which had been detailed that evening. If he were called upon to define the word empirical, he should say it was a series of experiments without scientific indication as to the results. He should be very sorry to apply any harsh epithet to anything that had been said, but it struck him as most extraordinary that a gentleman should employ the word empirical to any series of experiments which, if entered upon by the most ignorant painter, could hardly be said to be deserving of that epithet; for he was sure that it required but little knowledge of chemical science to tell, *à priori*, what would be the results of three-fourths of the experiments detailed to them that evening. Generally speaking, scientific discoveries were made by a series of experiments directed to a particular end, founded upon some known chemical evidence. They were told that the art which they (the boilers) pursued was also unsuccessful; that they did not produce the article desired. He would appeal to any gentleman conversant with the article to be obtained in this country from respectable oil-boilers, whether it did not answer the purpose desired? Whether, when properly applied to paint properly prepared, it did not dry within a reasonable time? They could not only produce oil, drying within a reasonable time, but that which would dry within a specific time. They could have an oil that would ensure the paint drying within four hours, or within eight hours, and so on, till they could furnish them with a paint that probably would not dry in less than 50 hours. If he could produce them oil that would answer these purposes—however empirical the system by which it was obtained, at any rate it was not unsuccessful. Therefore, he thought that the author of this essay, instead of depreciating the processes already in existence, should have confined himself to bringing before this Society what he conceived to be an improved process. They had also been told that the article as ordinarily produced could not be used for either white paints or white zinc, in consequence of its colour, and was only available for paints of a dark colour. It was, however, remarkable that the contrary of this was the fact—for it was well known to painters that although boiled oil, of a dark colour, when applied to white paint, might, when first laid on, appear to have injured the colour; the paint would, in the course of a day or two, be found whiter than that made with the ordinary oil which had not been boiled. This was owing to the chemical change it had undergone. Much had also been said upon the injurious effects to health of the process of boiling oil as now conducted, and also with regard to its being an intolerable nuisance, and that it could only be carried on in localities where nuisances were tolerated. He was surprised that a gentleman possessing the means of information which the author of this paper had, should have committed himself upon this point. It was well-known that oil could be boiled with ordinary care in almost any locality without affecting the health of the neighbourhood. It was done in situations little dreamt of, and without its being discovered that such a process was going on. Nothing was easier than to pass the noxious vapours from the oil through a fire, thus destroying all cause of the nuisance. It was to be regretted that such statements as these should be publicly made, for, unfortunately, the prejudices of the public were sufficiently strong against manufactories. He did not mean to say that the process might not be so conducted as to be a nuisance; and it was a nuisance,; no doubt, if not carried on under proper precautions but it might be conducted in almost any locality so as not to be offensive or injurious. They had heard strong epithets applied as to the unhealthy nature of the process of boiling oil, because it was taken for granted that in boiling oil, lead was used in some form or other; and they had heard a great deal about the injurious effects upon workmen connected with the boiling of oil, the grinding of paints, and other operations in which the use of lead was concerned, but they found no difficulty in getting persons to manipulate not only in boiling oil, but in white lead, and other processes; nor did they find any greater degree of sickness or mortality about persons so engaged than amongst those employed in many other departments of manufacture. All that was required was to use ordinary care in the exercise of those precautions which experience had dictated. Mr. Binks had been unfortunate in dealing in a wholesale, and, he thought, illiberal manner, with the gentlemen engaged in this "injurious" business of boiling oil. They were told that the oil was scarcely to be met with in a pure state, and that all sorts of tricks were played with it by the boilers. Now, really these were hard expressions. He would not undertake to say that circumstances of this kind had not occurred, but he would say they were very rare; and he could name a large number of respectable houses who would scorn to be guilty of any such trick as that which had been imputed. He (Dr. Longstaff) must be allowed to say that he thought these assertions had been made without due consideration and without due knowledge. It was always a disagreeable thing to speak of one's-self, but he felt on this occasion that it was necessary to do so. He had been connected with manipulations upon oils for the last twenty years. Prior to that he was occupied as a public teacher of the important science which had given rise to all the improvements connected with oil and its combinations. He therefore did not bring to bear upon the experiments which he had conducted twenty years ago, and which he had continued more or less up to the present time, a small amount of the necessary theoretic scientific knowledge which he conceived was essential before commencing these experiments. There had been brought before them to-night a number of articles that could be used advantageously in bringing about this desired article, viz., oil that would dry, and that could be manufactured with ease, and without injury to health. He was perfectly acquainted with these articles, and had used them in a variety of ways, before he knew Mr. Binks, or heard of the process which he had submitted that evening to the Society. Neither the articles which were used, nor the process which was described, was new. Mr. Dunn patented, twelve or fourteen years ago, a process for passing through the oil a certain amount of atmospheric air—

A Member—Palm-oil, not linseed.

Dr. Longstaff—It was not likely that any one connected with manipulations upon oil, if he knew it could be done with palm-oil, would not try the same process with other oils. The experiment was tried, not only of blowing air through the oil, but also of blowing the oil through the air, with the same effect. The patentee had not thought of that evasion of his patent. Therefore it would appear that the result of the researches of Mr. Binks that evening was merely to bring together (and he gave him credit for it) a series of facts which were known to individuals before, but which were not published in the shape in which they had now been given. It was well known that every manufacturer—whether he produced an article chemically or mechanically—if he discovered anything which added to the quality, or which lessened the expense of its production, he did not publish it, but was inclined to keep it to himself. That practice he (Dr. Longstaff) had adopted with regard to his discoveries in chemistry—since almost all chemical patents might be easily evaded. He knew of no patent equal to keeping the secret to himself as long as possible, and making the most of it. He was not about to tell them all the experiments he had performed, but he would say that oil had been boiled for a number of years upon principles which he considered quite as scientific as those which had been detailed that evening, and with as satisfactory results, inasmuch as the demand for the article had been large, and it had given universal satisfaction. Mr. Binks had spoken of the hydrated protoxide of manganese, and had said that that was the last article theory would suggest to him, because, instead of yielding oxygen, it was a powerful de-oxidiser. He (Dr. Longstaff) had arrived at the opposite conclusion. Any person acquainted with the manufacture of sulphuric acid, knew the part which nitric oxide played in it. It was a powerful de-oxidiser, and was used to carry the oxygen from one substance and deliver it to another where it was wanted. In a similar manner he would use the ingredient referred to. Mr. Binks said he found there was little difference in the result whether he used five, ten, fifteen, or twenty parts; and, therefore, that the action which took place had nothing to do with the doctrine of chemical equivalents. He (Dr. Longstaff) thought Mr. Binks ought to have ascertained how small a portion it was necessary to use to produce the result, and he thought he would then have found that he could not go beyond a certain point, and would have proved the same law obtaining in this operation as in all other chemical operations, viz., that there is a law of chemical equivalents; and in using these ingredients, a certain quantity was necessary; that if they used less they would fail, and if they used more it would not add to the results. He was sorry that he should have to act the part of the critic; but being connected with this manufacture as now carried on, and believing as he did that such processes were conducted upon as scientific principles as any of the ordinary chemical processes of the day, he thought he should have failed in justice to himself, and in justice to the author of the essay if he allowed the statements he had made to go forth without some explanation, if not without the contradiction which he had ventured to give them.

Mr. Rowney (in reference to some specimens of oils exhibited by him) said they were not what was termed boiled oils, but dry oils from oxidation, having been subjected for a given time to atmospheric action, and then filtered, by which means all the properties of drying oils were obtained without chemical additions. If drying oil was required for artists' purposes the drier should be lead, because white lead being used in painting other mineral ingredients would be apt to produce a chemical change.

Mr. Hyde Clarke wished to ask Mr. Binks a question upon the economical part of the subject, which he had not yet explained. He had understood the author of the paper to state that the ordinary process of boiling was not equally applicable to the new class of linseed oils, or, rather, the adulterated samples which had been received from the East Indies. It was a matter of great importance that they should have a larger supply of those oils, and, therefore, he was desirous of learning from Mr. Binks whether the result of his process was to extend the class of oils which were applicable for the purposes of the arts—whether, as compared with the ordinary process of boiling, he was enabled to make use of a larger class of oils than those now employed?

The Chairman said, that the author of the paper just read, was entitled to thanks for bringing the results of his researches before the Society. It would be expected of him especially, from the highly complimentary manner in which Mr. Binks had spoken of his firm, to contribute his mite to the discussion. After the manner in which the trade had been attacked, he could not remain silent, and allow such statements to go before the public unanswered. He would confine himself to some practical observations and to the correction of some of the statements put forth in the paper. He was of opinion that Mr. Binks had not done the trade justice. The art of oil boiling and refining had been a very interesting study by himself and his associates for at least forty years, and the processes employed were the result of very numerous experiments, always conducted on chemical principles, on the large scale. He (the Chairman) said that the bulk of the boiled oil produced by his firm was sold with their paints, and used in them, to the extent of 1,500 tons per annum, of the whole amount of oil boiled by them. Notwithstanding this wide-spread consumption, and the many disadvantages under which paint was often applied, it was very rarely that they had a complaint of their oil. Mr. Binks had spoken of boiled linseed oil being excluded from use in white pigments, and that raw oil was substituted on account of the dark colour of the former. This he (the chairman) considered to be a mistake. Boiled oil was invariably used in thinning white lead or white oxide of zinc for use, with such proportion of spirits of turpentine as the intended style of painting might require; and would preserve the delicate white much more perfectly than either raw or refined linseed oil under the same circumstances. Again, the time named by Mr. Binks as necessary for drying boiled oil, was not in accordance with his (the chairman's) experience. It was true that this very much depended on the state of the atmosphere. In practice, during the summer, boiled oil, *per se*, dried in seven to eight hours; on a damp day in ten to twelve hours; in winter from twelve to eighteen hours. Refined linseed oil required, *per se*, 30 hours in summer, and in winter 40 hours. As regarded the danger from fire in boiling linseed oil, that was hardly a question for the consideration of the public. In his own case since 1811, he had but one accident from fire in boiling oil, and that was a trifling one, and was attributable to other causes than the nature of the process itself. On the sanitary view of the question, he could speak with confidence. He had no recollection of sickness at his oil works; and the men, when boiling, had to take their meals close to the coppers, in the midst of the fumes; they were all remarkable for robust health and ruddy faces. He was fully prepared to answer the remarks of Mr. Binks on the "life-shortening" entailed upon the operations in white lead, and the alleged advantage of using zinc white as a substitute; but this subject formed no part of the question of oil-boiling, and ought not to have been introduced by him. The question at issue was not zinc white *versus* white lead, but Mr. Bink's patent boiled oil *versus* the processes now in general use. It was also erroneous to suppose that the small quantity of lead that may be, or is used in boiling linseed oil, could have the slightest effect on any person using it, either in the process of boiling or painting with ordinary pigments, excepting white lead. He thought Mr. Binks had given a very exaggerated statement of the adulterations practised by certain professional oil-boilers and refiners, and that such a system had not been carried to any great extent; at all events, if it had, it was one that would soon effect its own cure. It became a question for the practical man to judge how far the system of Mr. Binks was worthy his notice, as being any improvement on our existing knowledge.

A vote of thanks having been passed,

Mr. Binks, after returning thanks, said, in reference to Mr. Varley's inquiry, that no free water remained in the oil on completion of the process, the whole was carried away by the atmospheric air in its passage through it. To Mr. Hanhart, who expressed some fears as to the too rapid drying of the oil for lithographic purposes, he said that such fears were needless under this operation, for to the oil could be given, *ad libitum*, any degree of drying power and viscidity. To Mr. Laing, who complained of the effects of sulphuric acid on refined oil, he replied that the materials used in his (Mr. Binks's) process, had the property of removing any acid. To Mr. Heywood, who spoke of the use of pure oxygen to thicken or solidify the oil, and of the action being an oxygenising one, he (Mr. Binks) explained that he admitted the necessity of reactions with oxygen; but that was not all, the phenomena were infinitely more complicated than that alone would imply. To Mr. Hyde Clarke, who wished to know if these new processes applied to other oils, the produce of the colonies, Mr. Binks replied that the reactions with such oils as the sunflower, the castor oil, the poppy-seed oil, and others, were so remarkable, as probably to lead to their economical application to various purposes. From Dr. Longstaff, who appeared as the advocate of vested interests against an innovation, there had fallen nothing whatever, that in the slightest degree affected either the novelty, the success, or the future progress of these plans. The Doctor was angry that he attacked a "class," omitting the conspicuous fact that, whilst in common with a daily growing public feeling of indignation against adulterations of all kinds, and Parliamentary Committees to help it, he (Mr, Binks), in his paper, most carefully and especially indicated the existence of many honourable exceptions. But so far from having overstated these facts, he had, on the contrary, most decidedly understated them, and had nothing to regret or retract from the plain history he had given, and which he well knew would find a welcome response in innumerable quarters. The Doctor's plain declaration this evening of his creed, as to scientific discovery, viz., that the best plan of all was to keep it to himself, and make money of it, was, of course, a revelation that, to this Society, would scarcely be altogether acceptable, for the Society's avowed object was to encourage publicity, and wherever there might be a good—the issue of scientific labour of any kind, to encourage, and to help its being broadcast over the face of the world. The Doctor had taken great offence at his term "empirical," when applied to the ancient and still existing oil-boiling processes, and, in rejoinder, he (Dr. Longstaff) declared his (Mr. Binks) mode of research, in this instance, also to be "empirical." He (Mr. Binks) was only too happy to accept the charge. "Empirical" had, as was well known, two meanings or significations—the one was a popular expression of contempt—the other a proper expression or description of a certain line of philosophical procedure. He (Mr. Binks) had most carefully described the line of procedure or of experimenting. He adopted it in this case, and he knew of no better word by which to describe it than "empirical." But, contrary to the "Empiricism" of the old oil boilers, it had ended in a discovery (its object and intention), whilst the empiricism of the oil boilers had only ended in Dr. Longstaff's remaining the advocate of a system about four times as old as himself. The doctor intimated, in pretty plain language, that he had always known of those peculiar reactions which he (Mr. Binks) called his own; and he gave, by way of proof, instances of the passing through oil of atmospheric air as long as fifteen years ago. Now, every one knew how common it was to employ atmospheric air to bleach oils; and, no doubt, many instances had occurred (as in the case of Mr. Blundell) in which linseed oil had been so treated. But in no instance whatever had it ever before been done in the conjoined manner in which he (Mr. Binks) employed it and to which conjoint action alone its valuable effects were due. It was needless here to remind the Society of the fact that, no sooner did an invention or discovery arrive at success than there started up immediately a host of claimants who assumed the position of "prior users." The perfect novelty of his (Mr. Binks's) discovery, had hitherto been acknowledged everywhere—both among the English, the French, and other foreign chemists—even among the Americans, and for the first time (by Dr. Longstaff that evening) had its novelty been disputed, though the doctor did not venture to allege that either he or any one else was ever previously aware of the peculiar action of the hydrated protoxides upon which it was founded, conjointly with the after-use and adjustment of atmospheric air. Dr. Longstaff had touched upon some points of the abstract chemistry of these operations in a manner that certainly excited in his (Mr. Binks's) mind the utmost surprise—coming, as it had from an "ex-teacher" of the science. He (Dr. Longstaff) disputed the deoxidizing action of hydrated protoxide of manganese, and alleged that this oxide would *give* oxygen, not *abstract* it; that it was capable, according to his notion, of playing a similar part to that played in sulphuric acid-making by "nitric oxide"—that is, it would either take oxygen or give oxygen, according to the other element or elements in contact. Now, the hydrated protoxide of manganese is so powerful an absorbent of oxygen, that it requires the utmost care of the chemist, either to obtain or preserve it without passing into a higher state of oxydation. It passes instantly, on mere exposure to air, into the sesquioxide, and in no instance whatever, throughout the whole range of chemical actions, can be given of its *imparting* oxygen to another element. Between the two sets of actions—those of this hydrated protoxide upon oil, and those with the oxides of nitrogen in sulphuric acid-making—there exists not the most remote analogy. The doctor's reasoning and his illustrations are, both of them, equally and most singularly at fault. The doctor also utterly mistakes his (Mr. Binks's) explanation respecting the peculiar action exercised upon the oils. Mr. Binks distinctly stated, that the hydrated protoxide unites both with the colouring matter of the oil and with its oleic acid, forming a reddish matter with the former, and an oleate of the oxide of manganese with the latter. Mr. Binks did not need to be reminded by Dr. Longstaff that both these actions must be accomplished under the operation of the inevitable law of combination in equivalents. What Mr. Binks had distinctly stated and meant, and obviously so, in his description of the oil's ultimate solidification, was that these actions *initiated* those changes, but did not issue through the transformation of the whole of the oleic acid of the oil, into an oleate of manganese.

The Secretary announced that Messrs. Wilson, of Liverpool, had promised to deposit at the Society's House, for inspection of the members, a series of samples of oils prepared by Mr. Binks' process.

The Secretary further announced that on Wednesday, the 10th instant, a paper, by Mr. W. Fothergill Cooke, would be read, "On the Utilisation of the Sewage of Towns by the Deodorising Process established at Leicester, and the Economical Application of it to the Metropolis." On this evening Dr. Lyon Playfair, C.B., F.R.S., will preside.

EXAMINATIONS PRIZE FUND.

The following additions have been made to the Prize Fund :—

	£	s.	d.
J. W. Gilbart, F.R.S.	£10	10	0
Chas. Wye Williams	10	10	0
Thomas Martin	5	0	0

EXPERIMENTS WITH SNAKE ROOT.[*]

Some experiments were made at the Society's House, on Friday last, with the view of testing the efficacy, as an antidote to the bite of venomous snakes, of a root recently brought to this country by Mr. Temple, Chief Justice of Honduras, and which, if not the veritable guaco so famed among the Indian tribes for its medicinal properties, resembles it closely in appearance, belonging to the same class of serpentaria, and which is universally reputed throughout Central America to possess similar virtues. Whether the powers ascribed to this herb by the snake-charmers and natives of Central America were real or imaginary, and whether the efficacy of the plant was universal, or limited to the bites of the reptiles indigenous to that part of the world, were problems which yet remained to be solved, and which assuredly deserved the attention of pathologists. Unfortunately, the experiments were not so successful as might have been anticipated. It was determined to test the potency of the plant, and for this purpose some eight or nine drachms of the infusion were given by Dr. Chambers to a healthy rabbit, which was then put into the same box with two puff-adders of the deadliest reputation, procured from the Zoological-gardens. For more than ten minutes the snakes endured the presence of the intruder, but at length they flew fiercely at him, and one of them bit him in the mouth. On being taken from the cage the same infusion was again administered, and the wound was fomented; but the hind legs became rapidly paralysed, tetanic convulsions supervened, and the animal languished and died in thirty-five minutes from the time it was bitten. Owing to the contraction of the jaws but little of the second dose of the infusion reached the stomach of the rabbit, and Mr. Temple was of opinion that the tincture would have afforded a fairer test, inasmuch as it had been prepared from the herb in a comparatively fresh state, whereas the infusion was made from the dry root, which may possibly be of inferior strength.

The following letter has been received from Mr. Temple :—

Sir,—I have received the following most interesting letter from Dr. Chambers, relating to the late experiment which was made at the Society of Arts for the purpose of testing the reputed virtue of the snake-root in curing snake-bites. With the doctor's permission I forward it to you for publication :—

1, Hill-street, Berkeley-square, Nov. 29, 1856.

My dear Sir,—I must not delay to thank you for the opportunity of seeing your experiments on the effect of snake poison yesterday. Though unsuccessful in proof of the antidote possessing any preservative power, I think what we saw was not without instruction. From what I heard and saw, I became satisfied that a repetition of such experiments must always be inconclusive, *whether successful or not*—that is to say, whether the rabbit to which the antidote was given recovered or not. Suppose

(First.) That the rabbit dies; then a fallacy may exist—

(A.) In the possibility of the antidote being itself a poison to the animal—

(B.) In the small size of the animal selected not giving sufficient natural reaction—

(C.) In its powers of vomiting up the nauseous drug.

(Secondly.) Suppose, on the other hand, that after taking the antidote, and being bitten, the rabbit recovers, or does not suffer; then a fallacy may exist—

(D.) In the fact that animals *bitten* are not always *wounded*. We ourselves saw the second rabbit bitten in the back, where the fur is thick, and not hurt. And pigs never suffer from snake bites, because of their dense skin—

(E.) In the fact stated by the keeper, that an animal, even if wounded so as to absorb some of the poison, does not always die. The symptoms may commence and not prove fatal. This must be still more frequently the case in the larger animals than in the smaller, because of their greater powers of resistance; and probably depends on the quantity of poison injected.

Fallacy A might be counteracted by trying the effect of the antidote alone; Fallacies B and C by experimenting on horses, which are as large as men, and cannot vomit what they are drenched with. A knacker's yard would afford ample facilities. Fallacy D cannot be avoided in using living snakes; the best way would be to get imported a sufficient store of snake-fangs to impregnate a lancet at will, and wound the animal at one's leisure. Mr. Waterton says that the Macoushi Indians of Demerara always have a store of the poison from the Labarri and Counacouchi snakes, to be used in the preparation of Wourara. (See "Waterton's Wanderings: First Journey," p. 55.) It might be preserved either by using the precautions employed for keeping vaccine virus, or by mixing it with vegetable matter (as is done in preparing the Wourara, of which the main activity lies, doubtless, in the snake venom). The greater command we should have over the experiment would much reduce Fallacy E.

All this will take time, and money, and trouble, but anything short of it can only lead to fallacy. You see the question we ask Nature is this: "Do the recoveries after the snake-bites arise from the employment of antidote, or from uncertain operation of the venom?" The question, so far, has purely a scientific interest, not a practical one; for I understood you to say, that the plant grows universally, and is universally used as an antidote—so that our belief will not extend the belief of the parties mainly concerned. But some truly practical questions might be solved by the opportunity of trying experiments more accurately. First, "Will artificial respiration, carried on for a sufficient period, restore a bitten animal in the same way as it will one wounded by Wourara?" (I refer to Lord Derby's donkey, experimented on by Mr. Waterton.) Secondly, "Is a person once bitten equally liable to be again infected, or is the snake poison like that of small-pox, vaccinia, scarlatina, &c., incapable of acting twice in the same individual?" This inquiry is suggested to me by the fact that persons much bitten by fleas, bugs, lice, and I believe by bees, do not suffer the same amount of inflammation as we do. A flea-bite in the denizen of a low lodging-house is simply a little puncture, barely visible, without any halo of redness. If such is the fact, inoculation with the venom of some of the milder snakes might preserve against the more deadly, as vaccine virus preserves against small-pox; or snake-venom might be a preservative against hydrophobia. Again, "Is the venom of different animals of a different nature, or is it merely the degree of concentration or the quantity injected which makes the effects various?" What leads to this suspicion is, that the local effects of wasp or hornet stings on the neighbouring nerves (viz. numbness and paralysis) and the erysipilatous inflammation they cause is identical with the more extensive results of snake-bites. If the suspicion were true, we should have in our own wasps and hornets a diffused agent, which might be concentrated into a most powerful one by artificial preparation.

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[*] See *Journal of the Society of Arts*, Vol. III., page 161.

Numerous other questions, whose solution would benefit humanity, or at least give us that power which springs from knowledge, might arise in the course of a series of experiments on deadly venoms such as I suggest.

The failure of plants of this sort to prevent the effects of snake poison on animals, is further confirmed by some experiments made (on rabbits, bitten by the whip snake) by Mr. Cæsar Hawkins, in 1830. These rabbits were thoroughly dosed and rubbed over with guaco, yet they died. just as yours did: nor did the reputed antidote seem to have the slightest effect on the symptoms, nor to have any influence in repelling the snake from the animal. The guaco was also tried in five cases of hydrophobia, without any effect on the symptoms, or at least with an effect very inferior to the palliation which hydrocyanic acid affords. Two of these cases were in dogs, and three in the human subject. (See *London Medical Gazette*, Vol. VI., p. 507; Vol. VII., p. 594; and Vol. VIII., p. 237.) So that, the "true guaco" seems as little to be trusted as "false guaco," if, indeed, they are not the same plant.

The doubts thus thrown on the efficacy of reputed antidotes should lead us to look in other directions for protection of the lives of our countrymen, whom it may be necessary to send out in large gangs, to clear the forests of the Isthmus for an inter-oceanic railway or canal. And I think, even the short opportunity we had of observation on Friday may teach us something towards it.

1st. *The snake could not bite through the skin of the rabbit's back.* Stout boots, hedgers' gloves, and leather breeches, would, therefore, be a complete guard to the parts covered by them. A short fang would not penetrate even a woollen jersey.

2nd. *It often took a bad shot at the part intended to be wounded.* If the snake is seen first, I am sure a moderately active man may keep it from biting his face, and destroy it with the well-known weapon, a carter's whip.

3rd. *The snake would not bite, so long as he was warm and comfortable.* When he had his blanket, or the rabbit's fur, to lie against, he was quite placid. Flannel bags, then, would be most efficient traps. The principle of making a comfortable place for a trap is that of the wicker-work bug-traps.

It would not be necessary that the whole population should be equally protected. One or two patrols, with a few pigs, trained, as they easily may be, to obey the voice, could clear the diggings of snakes every morning. The sleeping camp might be guarded with wire net, or perhaps by a ditch, filled with the broken bottles which always accumulate in an Anglo-Saxon encampment.

Any man who moves timber, or anything likely to be a hiding-place, without gloves on, should be fined, and a reward given for snakes' heads.

I feel sure, that further observation of the serpents' habits, would lead to such further means of safety, that fear would be ridiculous. At present, the danger arising from snakes concealed on branches of trees level with the face, seems a formidable one, and suggestions on this point would be valuable.

If many Englishmen go out as navvies to South America, I expect that the proportion of deaths from snake bites, to that of deaths from jungle fever, will be as 1 to 10,000. That invisible winged dragon is much more formidable than any creeping monster.

Believe me, my dear Sir,
Yours faithfully,
THOS. K. CHAMBERS.

R. Temple, Esq., &c., &c.

I quite agree with Dr. Chambers in thinking that the experiment which we tried the other day was inconclusive, and that even several experiments might be so; but it must be admitted that it is by experiments alone that we can arrive at facts. We are desirous of ascertaining whether there is any ground for the supposition, so generally entertained, that the snake-root is a remedy for snake-bites. We can only do that by making experiments upon animals which have been subjected to the envenomed tooth of those reptiles, and the means within our reach are extremely limited. It will not be denied that such experiments should be confined to animals in a healthy state; for, if tried upon condemned cattle, either on account of disease, or old age, it would be impossible to say, if the creature died, whether death was the result of the disorder, or of the poison. We are then compelled to have recourse to rabbits, Guinea pigs, dogs, cats, "rats and mice and such small deer," in order to try the efficacy of the real, or imaginary remedy. It would be a hopeless request to ask for a fine healthy racehorse, or hunter, or even a respectable cob, from Tattersall's; and I fear that our country friends would have a strong objection to "linding us the loan" of their milch cows and pigs. It might, however, be a matter for consideration whether a few ticket-of-leave men, and others of that genus, might not in this way be made subservient to science and the welfare of man. I merely suggest this as a hint, which, as parliament will ere long reassemble, I have no doubt will be acted upon.

Dr. Chambers is of opinion that the experiments must be inconclusive, whether they be successful or not. First, if the rabbit dies, there may be a fallacy. (A.) "In the possibility of the antidote being itself a poison to the animal." It is very difficult to say what is, and what is not, a poison. Almost every plant may be said to be poisonous, if a sufficient quantity be taken. In this sense, probably, a strong dose of the tincture of the snake-root might be poisonous to the rabbit, inasmuch as it is a powerful stimulant. In the ordinary acceptation of the term, I do not think that the herb would be poisonous to a rabbit, or any other animal. It grows wild in the woods, and every animal, large and small, has ready access to it. I have heard it stated by intelligent and observant men, who had long been companions of nature in her wildest forms, that if the snake-root, or guaco were very abundant in any place, that circumstance amounted to a notice of "beware of the snakes;" for most assuredly in that favoured spot those ancient enemies of the human race, like the merchants on the Rialto, "most did congregate." If this be true—and I must admit that it sounds very romantic—it would seem that nature, whilst she sent the poison, beneficently placed the antidote near at hand. There are certain birds in Central America which feed upon snakes and lizards, without being at all particular whether they are poisonous or not. These birds are frequently observed to partake of the leaves and bark of the guaco. Does the instinct of these animals—a quality in the inferior orders of the creation so much superior for self-preservation, to human reason—direct them to this plant as a remedy for the poison of the snakes which they may swallow? It is not a violent presumption.

(B). "In the small size of the animal selected not giving sufficient natural reaction." That is unquestionably a difficulty which we have to contend against. But although, from that circumstance, a failure in producing a cure would not be a fact conclusive against the supposed remedy, *one* successful experiment would be very powerful evidence in its favour.

"(C.) In its powers of vomiting up the nauseous drug." If the stomach of the animal *did* reject the tincture, or infusion, that fact would, of course, be observed, and the dose might be repeated. In the case of the rabbit on which we experimented a few days ago, I certainly thought that the fluid which proceeded from it, after it was put into the snake's den, came from the stomach, and that it was the infusion which had been previously administered to it. After the rabbit had been bitten, very little, if any, of the infusion which was given to it went, down its throat. Dr. Chambers thinks, on the other hand, that, supposing 'after taking the antidote and being bitten, the rabbit recovers, or does not suffer, that a fallacy may exist." This is, no doubt, true; but still, I think, the question would be decided by a number of experiments. If the skin of an animal like that of the pig, or the rhinoceros, or the armadillo, is so thick that the tooth of a snake would not penetrate to the blood-vessels, there is no question that a bite would be harmless, for the poison, to take effect, must come in contact with the blood. In such a case, therefore, if the tincture were administered, the non-dying of the animal would be productive of a fallacy, if it led to the belief that its life had been preserved by the drug. Again, it is not difficult to believe that the most poisonous snake may not at all times be able to inflict a deadly wound. But this may be accounted for. It is an ascertained fact that the poison of the snake is deposited in a small sac, which is placed at the root of a moveable fang situated in the upper jaw, immediately under the eye. This fang is hollow, and when it is pressed down upon the sac the poison is ejected from the point. If a snake, under excessive irritation, has bitten anything savagely, it is not unreasonable to suppose that it may have parted with the whole of its valuable stock on hand, and that time may be required to produce that peculiar combination of animal juices which constitutes the poison, and to re-supply the reservoir with the fatal fluid. If, then, a snake were to bite any animal before its malevolent mechanism had produced a fresh supply for the market, it is probable that the injury inflicted would not be more serious than an ordinary wound. In trying an experiment with a venomous snake, care should therefore be taken that it should not bite anything for a considerable time previously. What are the constituent parts of snake poison? In this scientific age, when analytical chemists so very much agree as to the nature and effect of all poisons, especially those which, like that of the snake, produce "*convulsions with tetanic complications*," why does not some person analyse this deadly product of the animal world, for the purpose of discovering a decisive antidote? Dr. Chambers asks whether a person once bitten is liable to be again infected, which inquiry is suggested by the fact that persons much bitten by fleas, &c., suffer less inflammation than those who are not inured to it. My experience in such matters does not enable me to support that theory. I have had much practical knowledge of bites of all kinds—mosquitoes, sand-flies, doctor flies, centipedes, cockroaches—and I must confess that I never could get used to them. It is a singular thing that the negroes, who are said to have an additional cuticle, and whose bodies are constantly exposed to every species of attack, feel much more acutely than Europeans the bites of mosquitoes and sand-flies. I have witnessed 100 or 150 black soldiers at parade on a calm, hot, cloudy morning, when the mosquitoes and the sand-flies have vied with each other in tormenting sinful man. Nothing could be more grotesque and ridiculous than the actions of those sooty warriors. First they would clap the backs of their hands, then slap their faces, and then, at the moment they were commanded to present and make ready, drop their muskets on the ground, and tear the flesh off their calves and ancles. I do not think that human nature can get reconciled to bites. As to the effect produced upon different persons, that, no doubt, will much depend upon the state of the blood and the general condition of the body. I knew a person who, being bitten by a snake, died within an hour—he was a confirmed drunkard. In a healthy person the venom would be much slower in its operation. Very much also will depend upon the part which is bitten. A wound inflicted on the ancle, or the calf of the leg, will not be so rapid in its effects as one on the thigh, or the throat. Dr. Chambers advises persons who are called by their duties to be much in places which are infested by snakes to wear thick, high boots, and hedgers' gloves. This would, undoubtedly, be a very wise precaution. But a thick leather boot will not always protect a person from the bite of a snake. A very singular example of this was related to me. A man wearing a pair of stout boots, which came up to the knees, shouldered his axe one fine morning, and proceeded to the forest to cut wood. After he had aimed a few strokes, a snake, not approving of his proceedings, bit him in the calf of the leg. Our woodman, however, thinking that his boot had sufficiently protected him, laughed at the snake, and went on with his work. But after a little time a feeling of sickness and stupor came over him, and he thought it advisable to wend his way home, which he did, and died in about an hour after he had got there. The boots—they were capital boots—were sold. The fortunate possessor, as he thought himself, carried them home, and then put them on to see if they would fit. In a few hours he was a corpse. This was considered very strange—some thought it was apoplexy, some paralysis, and some thought it was an affection of the heart—but nobody thought of suspecting the boots. In a short time they again had an owner. It will scarcely be credited —but it is a fact—this man died also. At length the boots were examined—what caused the investigation I do not know, but I suppose the fell Atropos thought she had done enough mischief with a pair of boots—and in one of them was found sticking the tooth of a snake, in such a manner that in drawing on the boot the leg must inevitably be scratched by it. But mosquitoes even will bite through a boot, unless it be very thick indeed. There is a species of mosquito called the striker—a large, greyish, villainous-looking monster—against which scarcely any clothing is a protection.

Dr. Chambers is doubtful whether the "true guaco" and the "false guaco"—the plant with which we experimented, are different plants. They are certainly very different indeed, although the one which we used would be called guaco by most of the natives in Central America. I shall give you a very particular account of the real guaco in a short time, and state a number of cases to prove its title to be considered a remedy for snake bites. In the meantime, I think it will be very desirable to try some more experiments with the "snake root," and, if we arrive at the conclusion that it is worthless, to cause that fact to be disseminated as widely as possibly in Honduras and Central America, in order that no unfortunate recipient of snake venom may lose valuable time by indulging in delusive hopes that it will prolong his existence.

There is much food for thought in the interesting letter of Dr. Chambers; and the observations which I have made are not intended to express any difference of opinion from him, but to promote discussion upon a matter of paramount importance to all those whose destiny leads them to pass much of their time amongst the jungles of India, or the dense forests of Central America. I am, &c.

R. TEMPLE.

December 2, 1856.

Proceedings of Institutions.

Huddersfield.—The annual distribution of prizes in connection with this Institution took place at the Philosophical Hall, on Wednesday evening, the 26th ult., under the presidency of Lord Goderich. Prizes were given by his Royal Highness Prince Albert, by Lord Goderich, by H. Tindal Atkinson, and other gentlemen. Amongst the gentlemen present were, Viscount Goderich, M.P., the Right Hon. Sir John Pakington, Bart, M.P., the Rev. Dr. Booth, F.R.S., from the Society of Arts, Edward Baines, Esq., president of the Yorkshire Union, John Hope Shaw, Esq., president of the Leeds Philosophical Society, Edmund Eastwood, Esq., president of the Huddersfield Mechanics' Institution, &c. Mr. F. Curzon, the secretary, read the report. The distribution of prizes then took place; after which the meeting was addressed by Lord Goderich, who said he was sure the many gentlemen of eminence and distinction present could not have contemplated the scene before them without a feeling of hope for the future of a district that could bring together between 700 and 800 students such as those before them, and which could show some who had displayed considerable attainments. The distinguishing feature of the Huddersfield Institute was its classes. They heard in these days, and heard most truly, of the worthlessness of testimonials; but those members of this Institution who had just received prizes had received a testimonial which could not be disputed; and he could not doubt that those in this district who had to engage the services of such persons would be inclined to give great weight and effect to a candidate for employment who was the holder of one of these prizes. On a recent occasion, when the Society of Arts established their examinations, they sent circulars to the large employers of labour throughout the country, asking whether they would be ready to give weight to the certificates that might be awarded by the Society, and they received to that invitation a most complete response. Now, what was done by them on a large scale throughout the country would, he was convinced, be done on a smaller scale within that district. Most of them were aware that in the course of next year it was the intention of the Society of Arts to hold in that town their annual examination of the members of Mechanics' Institutions in the North of England, for the purpose of awarding their valuable certificates. They would then have to compete with other students from the Mechanics' Institutes of Yorkshire and Lancashire, and to maintain not only their own position, but that of their Mechanics Institution, to show to the Society of Arts they had been right in selecting Huddersfield as the place at which their examination was to be held. The gentlemen who had consented to act as examiners to the Society of Arts were men of the greatest distinction and ability in the various branches of knowledge to which they had devoted themselves. His lordship concluded by speaking of the debt of gratitude they owed to those who had acted as voluntary teachers. The Huddersfield Mechanics' Institution was engaged in the great work of popular education; and when they saw such zeal, such attention, and such results, he, for one, felt it impossible to despair, that in "a good time coming," that work would be accomplished; and that the highest aspirations and hopes of those who had permitted themselves to look foward hopefully to the future would not be disappointed, so long as men were found to study in the spirit which marked the students of that Institution, and to teach in that yet nobler spirit which actuated its teachers. The Rev. Dr. Booth proposed the first resolution, which was in favour of the introduction of the principle of education into the system of instruction at Mechanics' Institutions. He had so recently, and on more than one occasion, placed before the public his views on educational matters, that he would detain them only by a very few brief observations. That the education question was the most important social problem which awaits solution, did not admit of a doubt. It lay at the very root of every social reform. The great point of discussion at the present time was this, whether education should be promoted by efforts which are purely spontaneous and voluntary, and therefore uncertain, or whether the whole country should be called on to make an united effort to establish a national system. Somehow it was taken for granted that, having levied a rate, and nominated the managing committee, and built the schoolhouse, and provided apparatus, and engaged the master, all which can possibly be required is accomplished, and the education of the children of the neighbourhood was thus secured. But what if the children would not come to the school, or would leave it again before they had acquired a smattering of the rudiments of the commonest elementary knowledge; how was this state of things to be provided against? This was no far-fetched anticipation or doubtful apprehension. It was realised in all the yearly reports of her Majesty's Inspectors of Schools. It was the universal complaint that the children of the poor left school earlier every succeeding year. That as the quality of the education is improved, the time given to school by the children is shortened, so that the final result is a deterioration rather than an improvement. They might depend upon it, they would not sensibly raise the standard of education until they created a demand for it. Let the Government of the country make intelligence and industry the passports to employment, not private interest or family influence. Let the great public companies, the great employers of labour, look only to the fitness of the candidates for employment, and then they would see a very different state of things. Whether they would have a state system of education, or a voluntary scheme, was a matter of very insignificant importance, compared with this,—whether the country at large, not merely the Government, but the other great employers of labour as well, shall insist upon education as a necessary passport to every but the lowest and least remunerative employment. The schools they had at present were only half-filled. But if by any means they could make instruction a necessary, somewhat like meat, drink, or clothing, people would endeavour to procure it. Education, though essential, was not a pressing want, and like religion, but too many were contented to live without it. They should create a demand for education, and the supply was sure to follow. Let them promote only those who are well instructed, or who have instructed themselves, and a supply of the right men for the right places would not fail them. John Hope Shaw, Esq., seconded the motion. The next resolution, which spoke of the advantages of classes, was proposed by Sir John Pakington, who said he rejoiced in the practical proof of their success which had been shown that evening. He considered the Yorkshire Union of Mechanics' Institutes an honour to the country, and he was glad of the opportunity of expressing his high respect for Mr. Baines, the President of that Union. W. Willans, Esq., seconded the motion, and said he should be happy to contribute a prize next year. The next resolution was proposed by Edward Baines, Esq., and was to the effect "That the measure proposed by the Society of Arts to hold annual examinations of students of Mechanics' and similar Institutions, and to give prizes and certificates for proficiency, which has received the approval of a large number of employers throughout the kingdom by the declaration of these that they will attach respect to such certificates, is an important and valuable means of extending and improving the education of the people, as it will constitute an efficient practical stimulus to study on the part of members of these Institutions." He (Mr. Baines) could remember when there was no Mechanics' Institute in Huddersfield. They then met in small numbers in the ill-lighted Lancasterian school; and at that time it was impossible for him to look forward to such a scene as had been witnessed that evening. The speaker next adverted to the forthcoming examination of the Society of Arts in June next. He looked upon the proceedings of the present evening as a rehearsal of those that would take place next year; and he advised the members still to work on, as on that occasion they would have Leeds, Bradford, Sheffield, and Manchester, as well as others from Yorkshire and Lancashire to compete with. With reference to the prize fund, at least there would be £500 to distribute in prizes; but in Yorkshire they ought to do more than this; and he sincerely hoped the gentry would send in subscriptions, and show that they felt an interest in the education of the people. Where such a state of things existed, there must be a greater amount of moral excellence, and they would thereby raise the whole moral status of society. The resolution was seconded by James Hanson, Esq. John Brooke, Esq., moved a vote of thanks to the donors of prizes, which was seconded by Emanuel Eastwood, Esq., president of the Institution. A similar vote was proposed to the examiners by Joseph Rothery, Esq., and was seconded by Mr. Marriott. A vote of thanks to the chairman was proposed and seconded by Joseph Batley, Esq., and Dr. Cameron, and after being responded to by Lord Goderich, the meeting separated. The annual *soirée* was held on the following evening, and was well and numerously attended. Lord Goderich again presided, and the assembly was addressed by Sir Robert Peel, Major-General Windham, Edward Akroyd, Esq., the Rev. S. Holmes, T. P. Crosland, Esq., Sir William Milner, Bart., H. W. Wickham, Esq., M.P., as well as by most of the speakers of the preceding evening.

To Correspondents.

Mr. Chadwick's reply to Mr. Bridges Adams' paper on "Men and Manufactures" has been received, and publication is deferred for want of space.

MEETINGS FOR THE ENSUING WEEK.

MON. London Inst., 7. Prof. Odling "On Organic Chemistry."
Geographical, 8½. I. Mr. J. S. Wilson, "Extracts from a Journal of the North Australian Expedition." II. Mr. W. K. Loftus, "On the Determination of the River 'Eulæus' of the Greek Historians."
TUES. Syro-Egyptian, 7½. Rev. Dr. Hewlett, "On the Botany of Egypt, as illustrated in the ancient Sculptures and Paintings."
Civil Engineers, 8. Mr. W. Bell, "On the Laws of the Strength of Wrought and Cast Iron."
Med. and Chirurg., 8½.
Zoological, 9.
WED. Literary Fund, 3.
London Inst., 3. Prof. Rymer Jones, "On Vivaria and their Inhabitants."
Royal Soc. Literature, 4½.
Society of Arts, 8. Mr. W. Fothergill Cooke, "On the Utilization of the Sewage of Towns by the Deodorizing Process established at Leicester, and the Economical Application of it to the Metropolis."
Graphic, 8.
Microscopical, 8.
Ethnological, 8½.
Archæological Association, 8½.
THURS. Philosophical Club, 5½.
London Institution, 7. Dr. R. E. Grant, "On the Natural History of Extinct Animals."
Antiquaries, 8.
Royal, 8½.
FRI. Astronomical, 8.
SAT. London Institution, 3. Mr. T. A. Malone, "On Experimental Physics, chiefly in Relation to Chemistry."
Royal Botanic, 3¾.
Medical, 8.

PATENT LAW AMENDMENT ACT.

APPLICATIONS FOR PATENTS AND PROTECTION ALLOWED.

[*From Gazette, November 28th*, 1856.]

Dated 15th October, 1856.

2406. George Guillaume, Southampton—An apparatus for obtaining motive power by means of water or other fluid.

Dated 31st October, 1856.

2558. Benjamin Goodfellow, Hyde, Cheshire—Certain improvements in the construction of steam-boilers, and in the mode of supporting steam-boilers on their seatings.

Dated 12th November, 1856.

2658. John Patterson, Beverley, York—Improvements in apparatus for churning, which apparatus is also applicable to the washing of roots and other substances.

2660. George Islington Bache, Glasgow—Improvements in lamps and apparatus for affording or supplying artificial light.

2662. Joseph Eccles, Blackburn—Improvements in machinery for making bricks, tiles, pipes, and other articles made of plastic materials.

2664. William Henry Balmain, and Thomas Colby, Saint Helen's, Lancashire—Improved means of grinding various substances.

2666. James Apperly, and William Clissold, Dudbridge, Gloucestershire—Improved apparatus for condensing wool, cotton, and other fibrous substances.

2668. Richard Archibald Brooman, 166, Fleet-street—Improvements in the preparation of fibres for spinning, and in machinery employed therein. (A communication.)

2670. Frank James Wilson Peckman, Puckeridge, Herts, and Charles Frederick Pike, Oxford-street—An armed glove or covering for the thumb and fingers.

Dated 13th November, 1856.

2672. John Henry Johnson, 47, Lincoln's-inn-fields—Improvements in machinery or apparatus for cutting and folding paper. (A communication.)

2674. Charles Wastell Dixey, 3, New Bond-street—Improvements in double opera glasses, and other glasses of a similar nature.

2676. Thomas Stephen Holt, Manchester, and Edward Earnshaw and James Barlow, Rochdale—Improvements in certain parts of steam-engines, steam-boilers, and apparatus connected therewith.

2678. Thomas Earp, Newark-on-Trent—A tap for measuring liquids.

2680. John Kinniburch, Renfrew, N.B.—Improvements in moulding or shaping metals.

Dated 14th November, 1856.

2682. Peter Armand le Comte de Fontainemoreau, 39, Rue de l'Echiquier, Paris—An improved method of forming letters and other devices on metallic surfaces. (A communication.)

2683. Joseph Hacking, Bury, Lancashire—Certain improvements in machinery for dressing, polishing, and finishing threads and yarns.

2684. Thomas Beatt Sharp, and Joseph Anthony Collet, Manchester Certain improvements in locomotive steam-engines.

2685. Adolphe Emanuel Huart, Southampton, Surrey—An improved toy for the use of children.

2686. Richard Emery, 6, King-street, St. James's-square—Improvements in springs for carriages and other vehicles.

2687. Richard Emery, 6, King-street, St. James's-square—Improvements in the construction of axles and boxes of carriages for common roads.

2688. John Rock Day, and Thomas Rutter, Birmingham—A new or improved metallic tile for roofing or covering buildings.

2689. Edward Money, 14, St. James's-square—An improved artificial manure.

2690. Jean Baptiste Heu, 15, Rue St. Lazare, Paris—Improvements in preserving animal and vegetable substances suitable for food. (A communication.)

WEEKLY LIST OF PATENTS SEALED.

November 28th.

1283. Fred. Luke Stott, Thomas Belward, and J. Findlow.
1299. Gustavus Gidley and Wm. Christopher.
1301. Bennett Johns Heywood.
1305. Victor Jean Baptiste Mauban.
1330. Edward Hatton.
1331. Duncan Morrison.
1333. Duncan Morrison.
1349. James Somerville.
1380. Armand Eugene Preux.
1386. John Henry Johnson.
1438. Charles Clifford.
1489. Charles Durand Gardissal.
1515. John Henry Johnson.
1550. Joseph Henry Van Hengel.
1658. Jean Louis Lucas and Albert de Briges.
1973. James Wadsworth.
2120. William Henry Forster.
2134. John Talbot Pitman.
2161. Alfred Vincent Newton.
2184. Thomas Callender Hinde.
2223. John Morrison.
2249. Arthur Albright.

December 2nd.

1303. Auguste Cadet.
1314. George Josiah Mackelcan.
1315. Edwin Heywood and Thomas Ogden Dixon.
1334. John Christophers.
1341. Andrew Edmund Brae.
1360. Samuel Dyer.
1377. Carlo Pietroni.
1388. Alfred Vincent Newton.
1425. Henry Holland.
1426. John Sadler, Josiah Green, and Thomas Davis.
1440. Caleb Perry Sharpley.
1475. Isaac Atkin and Marmaduke Miller.
1560. William Hickling Burnett.
1598. Henry Bollmann Condy.
1608. Alfred Vincent Newton.
1680. Charles Barlow.
1837. Thomas Barnabus Daft.
2163. Robert Walker, jun.
2214. John Roberts and James Beech.
2251. John James Russell and Joseph Bennett Howell.
2282. George Tomlinson Bousfield
2382. Timothy Gilbert.

PATENTS ON WHICH THE THIRD YEAR'S STAMP DUTY HAS BEEN PAID.

November 24th.

2758. Georges Ed. Gazagnaire.

November 25th.

2762. Louis Cornides.

November 26th.

2771. John Carter Ramsden.
2778. Auguste Edouard Loradoux Bellford.
2783. Peter Armand le Comte de Fontaine-moreau.
2804. Alexander Brown.

November 27th.

2772. Alexander Maconie.

November 28th.

2788. John Patterson.

November 29th.

2784. Edward Keating Davis.
2798. John Henry Johnson.
2810. Samuel C. Lister.
2820. Squier Chevin.
2851. Joseph Robinson.

Journal of the Society of Arts.

FRIDAY, DECEMBER 12, 1856.

FOURTH ORDINARY MEETING.

Wednesday, Dec. 10, 1856.

The Fourth Ordinary Meeting of the One Hundred and Third Session was held on Wednesday, the 10th inst., Dr. Lyon Playfair, C.B., F.R.S., in the chair.

The following Candidates were balloted for, and duly elected members of the Society:—

Chowne, William D., M.D.
Critchett, George
Dove, William
Eassie, William
Gill, Robert
Moore, William
Pope, William Agnew
Sharp, Joseph Budworth
Shute, T. R.
Squier, E. George
Thring, Edward

The following Schools have been taken into Union since the last announcement:—

Clarendon House School (Lambeth).
Ing's House Academy (Wakefield).

A transparent glass ventilator, and specimens of glazing in painted glass, obviating the necessity of a large proportion of the lead joints at present used, were exhibited by Mr. W. Cooper.

The Paper read was:—

ON THE UTILISATION OF THE SEWAGE OF TOWNS BY THE DEODORISING PROCESS ESTABLISHED AT LEICESTER, AND THE ECONOMICAL APPLICATION OF IT TO THE METROPOLIS.

By Mr. W. Fothergill Cooke.

I am to have the honour this evening, in compliance with a request from the Council, of addressing the Society on the important subject of the utilisation of the sewage of our larger towns for agricultural purposes. The proposition includes, not only the converting of putrifying refuse matter, rich in the food of vegetable life, to a useful purpose, but also the purification of our streams, and the improved health of the crowded population of our streets.

This three-fold good may be attained in different ways—1st., by employing the sewage as it passes from the town, to flood or water the land. 2nd. By separating chemically and mechanically both the salts dissolved and solid matter suspended in the sewage, allowing the putrified water to flow off into its natural channel-beds, whilst the solid residuum is prepared in a convenient form for agricultural use.

The plan of irrigating by sewage water has long been in operation on a small scale at Edinburgh and elsewhere, with the most satisfactory agricultural results; and the deodorising system has, so far as its sanitary and manufacturing results are concerned, achieved a perfect success at Leicester.

There the entire sewage of a population of 65,000 has been operated upon since May, 1855, to the present day, and 6,000 tons of solid matter have been separated from seven or eight million tons of sewage. We have, then, in both cases, practical facts, not theoretical schemes, to deal with, but the commercial question, whether the sewage will bear the cost of conveyance and distribution, and the solid manure the cost of manufacture, remains to be determined.

It is my intention in this paper to consider the subject of deodorising sewage with especial regard to the drainage question of the metropolis, in which case the commercial value of the solid matter is of minor importance, provided that the deodorising system offers as an equivalent a large saving of capital in the requisite works, and still more important sanitary advantages. But I hope to prove, that in dealing with the enormous amount of sewage produced in this metropolis, it is by a combination of the fluid and solid plans that the most beneficial results will be arrived at both to town and country.

I do not, however, mean to shrink from discussing the question of agricultural value in the deposit, and I take this early opportunity of stating my belief that the solid sewage has sufficient value as a manure to insure a sale at a price which will cover the very low cost of production, and in due order I will state facts on which I have formed that opinion.

Having mentioned that fluid sewage has been most advantageously applied to land (especially meadow land and crops of Italian rye grass) under particular circumstances of season and locality, I desire, before I proceed to describe the deodorising system, to state my reasons for thinking that no method yet proposed for the employment of unprepared fluid sewage is applicable on a large scale to the metropolitan district, and then in due order, I shall have an opportunity of pointing out how the objections to the fluid system may be obviated, by working it in conjunction with deodorisation.

The supply of fluid sewage being constant, it should be dealt with constantly; it cannot be accumulated or stored up. But the farmer cannot constantly employ it. He cannot employ it where his ripening crops are standing, nor during frosts—nor will he desire it when long continued rains or deep snows have soddened his heavy clays. During the dry winds of March, and after the hay harvest in June, he will gladly take a full supply; and again, during the autumn season of continued drought and with bare fields, all the farmers of the district would be clamorous for a portion of the then stinted stream of sewage, shrunk by the same drought below its average amount.

The sewage of the metropolis is said to contain some 10,000 tons of ammonia, a quantity which would suffice to supply with ammonia about 500 square miles of land annually. But the sewage containing that quantity of ammonia would be too small to be distributed equally over the land; and, practically, one square mile daily would be the largest surface that could be dressed with sewage. The demand during the dry season would exceed this. The idea that naturally suggests itself is, let a reservoir be made that shall store-up the accumulation of the previous season. But the reservoir required for only one day's supply of sewage during dry weather must measure more than 12 million of cubic feet, and would occupy some 31 acres of land ten feet in depth, and such a reservoir, with its putrescent exhalations, must be hermetically sealed up.

Such a project is obviously impracticable. The sewage, when not required for irrigation, must either run to waste or be differently treated.

But even without such a storing of putrescent matter, would there be no danger to the health of the country population in having several square miles of land between London and the Thames' mouth soaking, or drying after a soaking, with fermenting sewage-dressing leaving on the surface a scum of putrifying organic matter under a burning July sun,—a gentle easterly breeze wafting the fragrance over the metropolis during the dog-days, mixed with the miasma of the Essex marshes?

The open sewage canal by which it has been proposed to convey the sewage to the Essex farmers, would in itself be a serious evil. It would expose to the air a surface of sewage extending over 45 acres in a course of 20 miles, and would be liable, in winter, to be frozen or choked up with snow.

Before a system of fluid manuring be adopted in the county of Essex, it behoves the authorities generally to consider whether the effluvia from an extensive area, saturated with stale sewage, poisoning the atmosphere by putrifying and steaming during the heat of summer, might not be as injurious to the health of Kent and Essex—aye, and of the metropolis itself, as the most efficient subterranean removal of sewage could be beneficial to the health of London and Middlesex.

Now let me turn, in contrast, to the deodorising system:—

The leading feature of the deodorising system is, that it does not deal with highly putrescent sewage, abounding with liberated ammonia, but with the fresh sewage as it descends in the sewer, before putrescence has made any material advance, and it is in that state, and before the sewage leaves its underground course to enter the deposit reservoir, that it is intimately blended with cream of lime, which instantly deprives the sewage of all odour, and precipitates almost the whole of the salts and solid matter contained in it to the bottom of a reservoir, from which it is removed again, always under the cover of several feet of scentless water, through covered channels to filter frames, and in these filter frames the consolidating process is completed.

Here is a bottle of the stygian stream flowing day and night through the deep sewers of Leicester, 18 feet below the level of the ground. In the act of being pumped up from the sewer, it is mixed with the substance contained in this bottle (the cream of lime) in proportions varying from 2 to 16 grains to a gallon, which instantly deodorises it, and gives the mixture the appearance you observe in this bottle. A rapid separation takes place, and the limpid effluent water, of which this is a sample, flows into the river, and leaves behind it a deposit which, upon being dried, is converted into this inodorous powder.

Before proceeding to describe, by the aid of drawings and models, the process, arranged and perfected by Mr. Wicksteed, at Leicester (to whom we are indebted for conceiving and working out the system), I will give in a few words the early history of the undertaking.

As far back as 1845, Mr. Thomas Wicksteed, formerly engineer to the East London Waterworks, a name well and honourably known in connexion with questions of water-supply and sewerage, was called upon to examine whether there might not be some practical and profitable mode of dealing with the sewage of London, and brought forward, at the suggestion of the late Professor Aikin, a scheme for separating, by means of lime, the solid matters and salts contained in sewage water, so as to render them portable and to apply them to fertilizing the soil, whilst the effluent water was discharged, free from all impurity.

Continuing to bestow for several years much attention to this subject, he introduced various practical improvements, which elicited a very favourable opinion from Mr. Robert Stephenson, corroborated by Professors Aikin and Taylor. A few gentlemen interested in the general question of the improvement of the salubrity of towns, subscribed £2,500 to try its efficiency by an experiment on a large scale at Leicester.

The result proved eminently successful; an act of incorporation was, consequently, obtained, and an engagement entered into with the authorities of Leicester, a town of 65,000 inhabitants, and full of manufactories, to purify its whole sewage, for which Mr. Wicksteed had also originated a plan of artificial drainage. This last-mentioned improvement was nearly completed in May, 1855, and the deodorizing works, which after numerous preliminary essays had been simultaneously executed, were then brought into full operation. Since that period the works have been in constant operation day and night, and in the course of nineteen months have separated about 6,000 tons of solid matter, from seven-and-a-half millions of tons of sewage, discharging only pure water into the river Soar, which the mass of separated impurity would otherwise have contaminated.

The sewage is conveyed to a spot less than a mile distant from the town of Leicester, and there, as rapidly as it arrives, and scarcely allowing time even for incipient putrefaction, it is raised eighteen feet, by pumps worked by steam power. Whilst passing from the pumps the sewage becomes intimately mixed with a body of lime and water, proportioned to, and constantly varying with, the nature of the sewage, which produces an instantaneous and perfect deodorisation. It then flows successively through two canals; the first 60 and the other 130 feet long, 45 feet broad, and 16 deep, which are traversed by the sewage water in about two hours and a-half, and the water which emerges when the lime has been well-proportioned is almost pure, and perfectly scentless, whilst the greater portion, or about seven-eighths of the solid matter originally held in solution or suspension, is deposited as fine mud in a trench at the bottom of the first canal, from which, by an Archimedes, or endless screw, the fresh deposit is moved by a continued action from beneath the deep stratum of the deodorised water, into a covered well. Thence it is lifted through a brick shaft to a small tank, in the upper part of the building, by a Jacob's ladder, similar in principle to the ladder of buckets used in dredging machines. A series of centrifugal machines are then charged with it, and effect the separation of the remaining water, leaving the deposit in a plastic state, fit to be formed into a brick or cake for drying. At present nearly 3,000 tons of this half-dry deposit are heaped up in the yard of the Leicester works, and emit no smell whatever.

For the interior of towns, where it is desirable that the operation should be closed in, a new patent filter, manufacturing about two tons of solid matter at one operation, is preferable to the centrifugal machines. The filter system admits of no communication whatever with the atmosphere, at any stage of the operation, until the deposit is withdrawn from it in the form of flat firm slabs, forty inches square and three inches thick, to be dropped from the press into a barge for daily removal. A full-sized filter would manufacture about eight tons daily, and three men and a boy could manage twenty to twenty-four filters. The following results are thus easily attained.

1st. The solid matter and salts held in suspension and solution in fresh sewage water, can be deposited by the chemical and mechanical action of lime before putrefaction commences, and can be manipulated in closed works and without exposure to the outer air, up to the moment of their conversion into firm inoffensive slabs, well suited for removal; a boat or cart-load of which, would be quite as unobjectionable as one of unburnt tiles or bricks.

2nd. The deodorized water, after passing through the first short canal of sixty feet in length, which may be viewed in the light of an enlarged continuation of the sewer itself, is so free from solid matter that it might be employed for flushing or diluting a lower line of sewers. To fit the deodorized water for street watering or for being discharged into an open river as at Leicester, it must be passed through a second canal from 130 to 250 feet in length, according to the degree of transparency desired. It must be borne in mind that after being thoroughly mixed with the lime the water is without smell, and therefore no longer requires to be vaulted over, but may be exposed to the atmosphere in an open channel where desirable.

In speaking of these channels, whether built-in or open, I have employed the term "canal," with the view of dissassociating them from the idea of stagnant cesspools. There is no analogy whatever between them and the cesspool-reservoirs or vast vaults of deposit to be formed on the banks of the Thames. It can hardly be doubted that the frequent necessity for cleaning out a pestilential accumulation of semi-liquid sewage from these last, would be an operation impossible to execute in any ordinary way.

The inhabitants of this great city, in maintaining their vitality consume about 12,000 tons of nitrogen annually, equal to about 15,000 tons of ammonia, 10,000 tons of which are, as I have before stated, carried off by the sewers. The phosphates amount to about 6,000 tons. Now, good guano, as it reaches the farmer, contains, on an average, about 16 per cent. of ammonia; and 4 cwt., or 450 lbs., of such guano per acre, would be considered a rich average dressing, and would contain 72 lbs. of ammonia.

The ammoniacal matter in the sewage of the metropolis would supply that quantity to 320,000 acres, or 500 square miles. Now, this quantity of ammonia, if it could be entirely preserved, would represent, at the market price of £60 per ton, £600,000.

When the idea first fixed itself in my mind, that during my own lifetime thirty million pounds' worth of ammonia had thus gone to waste from the city of London alone, I felt that the utilisation of the sewage of towns had become a question of the highest financial importance; but I felt also that there is another question linked with it, of a much higher order—the sanitary precautions which must precede that utilisation, on which precautions the health and lives of the population are greatly dependent.

For, mark how improved sanitary arrangements, with deep drainage, and a rapid removal and purification of the sewage, and consequently of the river, have been associated, at Leicester, with a decrease in the number of deaths; a decrease amounting to 275 yearly, as shown by this return from the Board of Health:—

Table of Mortality of the Borough of Leicester.

	First quarter.	Second quarter.	Half-yearly Total.	Third quarter.	Fourth quarter.	Half-yearly Total	Yearly Total.
1852	432	374	806	501	466	967	1,773
1853	448	348	796	404	480	884	1,680
1854	420	421	841	399	340	739	1,580
1855	450	366	816	344	348	692	1,498
1856	340	324	664	355	—	—	—

Deaths from Zymotic Disease.

1852—561
1853—371
1854—450
1855—232
Population in 1853—61,000
,, 1856—65,000

275 lives saved to the population of Leicester would be proportionate to 12,000 lives to the metropolitan population.

To aid in bringing about in London such a result as the spirited corporation of Leicester, by employing Mr. Wicksteed's plans and inventions, have effected in that borough, is an object worthy of any man's ambition; and the man who has devoted his engineering experience and inventive talents to so great a cause, can never look back, in future years, to the period of his life so occupied, or to his money so spent (whether with profit to himself or not) as time or money spent in vain, and such may justly be the reflections of Mr. Wicksteed.

There is but one feeling throughout England, as to the necessity of introducing every practicable sanitary regulation into our crowded towns, including an increased and improved supply of water, a deepening of the drainage, and a purifying of the streams from pollution. But all men are not so ready to admit that utilisation of our sewage should be part of such a system. "Away with it to the German ocean!" is the easier solution of the question.

I fear also there is even a stronger and more general feeling against the process of deodorising, and the manufacture of manure from the sewage; but I believe this feeling arises chiefly from the subject being taken in a wrong point of view. I must beg you will strive to banish foregone conclusions from your minds when listening to the statement I am about to make.

I am not going to describe solid sewage as an English guano, worth £4 or £5 per ton, but as a substance containing ingredients especially valuable on heavy soils, and available near the place of its production. I shall show that it can be made at three or four shillings per ton, and that it is likely to realise a rather larger sum in the market under judicious arrangements. It must be remembered that the great mass of farmers do not look alone to manures rich in nitrogenous matters. Lime, chalk, marl, seaweed, road scrapings, old mortar, cinders, and even clay, are paid for, and carted sometimes many miles during the less busy season of the year; and sewage manure will also find purchasers, at a low price, where it can be obtained at a short and cheap carriage. In this respect solid sewage works in London would be admirably situated, commanding by the river a water carriage on a tidal stream both up and down its course, in conjunction with several canals, offering great facilities for barging to convenient depôts. Solid sewage, though it may contain only 1 per cent. of ammonia, would be valuable on some soils from the earthy matters held in it, in an extremely divided state. Its composition, however, is very variable, and the analyses that have been published have been too often made from the dry lump, after long exposure to the air, and are so far fallacious.

Sewage contains the debris of every description of animal and vegetable matter, mixed with some valuable mineral substances. The refuse from our abodes, unquestionably forms the greater and more valuable portion. Man does not, like our farmyard animals, which fatten in a few weeks or months, carry off or retain much of the nourishment he consumes; his food is chiefly employed in renewing and not in increasing his frame. Every kitchen sink also supplies a large quantity of animal refuse, or waste. Each falling shower washes into the sewers impurities of the air, quantities of soot, finely triturated mineral matters, as well as potash from the decomposed granite of the streets. Manufactories add many other substances to the foregoing, and tons of soap increase the richness of the stream.

These miscellaneous matters, dissolved and broken down in the waste water, unite to form the sewage of London, which, unless stained by some bright coloured dye, generally offers a nearly uniform blackish grey mixture. Very little solid matter, except chips or shavings of wood, or feathers, ever make their appearance.

This sewage, then, contains a vast variety of ingredients, the most valuable being held in solution, and in the state most favourable for assimilation by vegetables, among others, a fair proportion of nitrogenous matter. But plants do not live principally upon nitrogenized food, not even those which most abound with it when harvested. Who ever thinks of giving his clover a nitrogenized manure? Gypsum, or ashes, are the most energetic stimulants to the growth of clover. Yet a crop of clover contains three times as much nitrogen as a crop of wheat. Give clover only a crop of sulphate of lime, and it will find its own nitrogen from the ammonia in the air, or in the soil. Again, the clover plant, after carrying off with it so large a quantity of nitrogen, is one of the best preparers for a crop of wheat, which delights in nitrogenous manures.

Solid sewage manure, therefore, should not be valued solely by the nitrogen it contains—nevertheless, it contains more nitrogenous matter than farmyard manure—besides, many other substances, which roots can seize upon during the gradual progress of decomposition; in fact, there is not a particle of matter which floats away in the sewage of this great city that may not one day enter as a component part into the vegetable system. Nothing therein would be wasted by nature, though so recklessly disregarded by man; useless, indeed, worse than useless to him, till vegetation has, by its re-constructive power, again organised, in the growth of its own structure (the future food of a higher order in creation), that very refuse, which animal life, having previously derived from the same vegetable source, had afterwards rejected as useless or effete.

The vegetable kingdom, placed by the Creator in the beginning, on the confines of vital existence, as the inanimate purveyor for animate life, is the true Phœnix, which springs a-fresh with ever-renewed vigour from the ashes of decay.

The fetid stream with which we have long wantonly polluted our noble river, and are now so anxious to pour wastefully into the ocean, carrying with it the disorganised fabric of the richest products from every varied agricultural district of the world, would, under wiser and more provident treatment, restore through the intervention of vegetable life in the succeeding year a bounteous supply of the bread "the staff of life" to the cottage of the poor, and "every luxury of the season" to the mansion of the rich.

The magic words that shall bring about this magical result are—

Irrigation and Deodorization.

Deodorisation, in its practical sense, does not simply mean the removal of offensive smell, but the purification of the water by the abstraction of all extraneous matter, 800 or 1,200 tons of water only furnishing one ton of solid dry residuum.

If this deposit is to be utilised, it must contain the salts, and especially the ammoniacal salts, with the undecomposed nitrogenous matter, but if the fluid part is to be employed for irrigation, then the suspended matters alone should be separated, leaving the more valuable salts in solution.

We now arrive at the question, what is the cost of production of this heterogeneous compound? I will give the answer for a population of 500,000.

		Per Annum.
Buildings and machinery, consisting of the lime pits, reservoirs, Jacob's ladders, and filters, £40,000, at £4 per cent.		£1,600
6 lime men, at 20s. per week...	£6	
15 filter men ,, ,, ,, ...	15	
6 lads at 10s. ,, ,, ...	3	
2 reservoir men at 20s. ,, ...	2	
29 hands Total...	£26	1,352
Wear and tear and stores		473
100 tons lime per week, at 12s. 6d.		3,250
Engine-power, hired from the pumping-engine		325
Total		£7,000

The make of deposit from the filters will be 60,000 tons per annum in a plastic state, like clay ready for brickmaking, the cost being 2s. 4d. per ton, including the discharge into carts or barges lying alongside the works.

The cost of removal I have not thought it necessary to include, as it may be set against the clearing out of the proposed reservoirs on the Thames.

The cost of pumping is greatly in favour of the deodorising plan. Mr. Bazalgette shows, in his report, that the engine-power for the western district will be reduced by deodorising at Kensington from £15,120 to £8,900 per annum. The above calculations are made upon the supposition that the whole of the sewage is deodorized and solidified in the outskirts of the metropolis. If, however, it were determined to combine deodorizing with irrigation, this portion of the expense would be much diminished, whilst the make would be nearly the same.

To effect the double object, the effluent stream on its course to the river would have to be conveyed through such an extent of the comparatively level county of Essex as could consume the water for irrigation.

Supposing the season to be favourable for irrigation, and the whole of the water to be required at any particular time by the farmers, the sewage would be treated with a greatly reduced charge of lime, only just sufficient to fix the sulphur, and precipitate the coarser and more putrifiable matters in suspension, allowing the salts in solution to pass off with the still turbid but deodorized water in such a state that the whole would sink into the soil without leaving a putrifying scum on the surface.

When a reduced quantity of irrigating water was needed, it would be passed down during a sufficient number of hours only to meet the demand, and at those hours when experience would have shown that the fertilising salts were most abundant in the sewage.

Such an arrangement might be facilitated by a simple line of telegraph between the sluice-keepers and the London works. By this combined system none of the sewage would ever run to waste, infect the atmosphere, or pollute the Thames at any part of its course. I shall presently have occasion to allude to a recommendation of the engineer of the Board of Works for the establishment of a deodorizing station near Kensington for the Middlesex sewage. Should that recommendation be hereafter adopted it is obvious that the land owners in the western district would enjoy every facility for enriching their own land by irrigation with their own sewage, instead of absurdly sending the sewage on a long journey through the metropolis to the Essex farmers at a cost of £12,000 per annum. The proposed system of metropolitan drainage does not provide for the sewage of Isleworth, Brentford, or Acton, which will continue to pollute the river above the bridges. The cure for the evil is obvious, namely, local deodorizing works at Brentford.

Before I attempt to explain the treatment to which I would suggest that the metropolitan sewage should be subjected, I will give a brief sketch of the new drainage plans for the metropolis, and the present state of that vexed question as it now fluctuates between the Metropolitan Board, and the chief Commissioner of her Majesty's Board of Works. And first, let me call your attention to the more serious evils of the present state of the sewerage of London. The Thames has ever been the grand arterial sewer of London; into it the drains of the whole metropolis flow at numerous places and at various levels. On either side of the river there is a considerable extent of low land, and the houses closely built upon it have their basements so much below the level of high water that the sewers beneath them can only discharge their contents for about four hours in every twelve, when the tide is lowest. The sewers are closed at their outlets during the rest of the day, by floodgates which prevent the river water flowing up and submerging the cellars of the houses, and are thus converted into cesspools under the streets, in direct communication with the houses built over them, where the sewage accumulates, stagnates, and putrifies.

Sewage, so detained in its passage to an outfall, becomes far more offensive than that which can flow off uninterruptedly, and any new system should obviate entirely this serious objection to the present mode of draining.

Beyond the low districts above described, the ground rises more or less in various places, and the sewage, produced by the population which covers these upper parts of the metropolis, might have been taken to the river at a level high enough to enable it to flow off at all periods of the tide. But this has not been done; the sewage is merely conducted to some near drain in the low district and subjected to the same inconvenience of being tide-locked, adding to the fetid mass for sixteen hours in the twenty-four.

But this is not all. The rain water which falls upon all the districts, both high and low, also descends into the low sewers, and as these are not of sufficient capacity to store the sudden influx of storm-water, in addition to the sewage already stagnating in them, whenever a heavy storm occurs they become overcharged, and in such cases the putrid sewage floods and destroys much valuable property, leaving entire streets unhealthy and damp for many days after.

Such is the present state of our London drainage and its main objections.

The cure of the evil is to be accomplished—

I. By an unintermitting flow in the sewers of those parts of London whose subsoil is below the level of high water, and this can only be effected by pumping up the contents of the drains to a level above high tide, in order to overcome, artificially, the natural disadvantages of these low districts. This is technically called providing the drainage with an artificial outfall, a mode of overcoming the difficulty of draining a flat district, first proposed by Mr. Wicksteed, for the city of Berlin, in 1841, and tantamount as described by Sir William Cubitt and Mr. Stephenson, in their report on the 17th of October, 1853, to raising the level of this low district twenty feet, and entirely overcoming the natural disadvantages of its situation.

II. The sewage of the upper districts must be intercepted and conducted to a natural outfall by gravitation *before putrefaction commences.*

III. The sewage conduits must have no communication with the houses or the outer air; the discharge must not prove a focus of infection and pestilence, and the Thames must no longer be a cesspool for the sewers of London. At present, with each rise and fall of the tide, the accumulated contamination of more than fifty days oscillates up and down the stream between Gravesend and Richmond.

The outfall of the sewage is, therefore, the pivot point of the entire system to which the local drainage is subsidiary. On this all-important point Mr. Stephenson and Sir William Cubitt reported their views, founded upon a series of experiments made by the late Mr. Frank Forster, the main object of which was to determine how near to London the sewage could be discharged into the river, without finding its way back again to the inhabited parts of the town. The experiments proved that it was essential to go at least as far as Barking Creek, and discharge the sewage at or near high water. For the delivery of the sewage into the river at high water is equivalent to its discharge at low water, at a point twelve miles lower down the river; therefore the construction of twelve miles of sewer is saved, by discharging the sewage at high, instead of low water.

I will now point out on this large plan the works proposed for the south side of the Thames. The low level sewer provides for a district of twenty-two square miles. This sewer commences at Putney, and is carried by Wandsworth, Battersea, and Kennington, to the pumping station on a piece of waste land on the east bank of Deptford Creek. The total length of this sewer is nine miles. The high level sewer is designed to intercept the sewage of fourteen square miles by gravitation. It commences at Clapham Common, passing by Brixton, Camberwell, and Peckham, and along the Greenwich road to the Deptford pumping station. Here the sewage of the "low-level sewer" is pumped up twenty and a half feet into it by engines of 520 horse-power. From Deptford Creek the united streams flow by gravitation to Woolwich, and thence through the marshes to Erith Reach.

To contain the sewage till discharged into the centre and bottom of the river, near the time of high water, a covered reservoir of 4½ acres is to be constructed, capable of containing 1,000,000 cubic feet of sewage.

We will now pass over to the north side of the Thames. The entire area north of the Thames, from which it is proposed to intercept the sewage, comprises about sixty square miles. For this area it is proposed to construct four main lines of intercepting sewers, forming four separate drainage areas, viz., the northern high level, and the middle level areas, from which the sewage would be conveyed by gravitation; the low level area, from which the sewage would be pumped into the high level outfall, common to the three areas, and the western area, for which two alternative propositions were laid by Mr. Bazalgette before the Metropolitan Board; the one which he recommended for economy, and as averting serious engineering difficulties, was the employment of deodorizing works near the mouth of the Kensington canal; the other proposition, which he seems to have given reluctantly as a pis-aller, costly and difficult of execution, inconvenient to traffic, and monstrous in its disregard to the health of the most populous part of London, *was to carry the sewage of the whole twenty-two square miles of the western district into and through the chief thoroughfares of the cities of Westminster and London*, because the deodorization of the sewage *was locally objected to.*

The northern high level area includes about ten square miles. The sewer commences at the foot of Hampstead-hill, and passing through Holloway, Hackney, and Victoria-park, to the river Lea, over which it is carried by an aqueduct. The middle level area includes about seventeen square miles, commences at Kensal Green, and passes through Notting-hill, Oxford-street, Clerkenwell, and Bethnal Green, and effects a junction with the former sewer, with which it will be carried over the river Lea to a reservoir, and thence discharged into the Thames at high water. The low level area includes about eleven square miles. The levels are so low that the aid of pumping is necessary to produce efficient drainage.

The low level sewer commences in Chelsea, passes along Parliament-street, by Whitehall, to Charing-cross, the Strand, and Fleet-street, to New Bridge-street, where it intercepts the Fleet sewer, Cannon-street, King William-street, thence through Eastcheap, Tower-hill, and Limehouse, passes under the River Lea, to a pumping-station near the Abbey-mills. There the sewage will be lifted about 37 feet to the high level sewers.

Mr. Bazalgette, in this part of his report, takes an opportunity of reiterating a recommendation which he, in conjunction with Mr. Hayward, had made two years before. He says, that the low level sewer should be constructed as near the Thames as practicable, both to avoid the public inconvenience along crowded streets during construction, and to intercept the sewage close to the existing outlets.

Should the long-contemplated embankment of the Thames between Westminster and London-bridge be carried out, much of the cost and difficulty of a river line of sewer would be obviated, and the intercepting sewer might be most advantageously constructed in conjunction with the embankment between Hungerford and London bridges.

The main difficulties and the greatest inconvenience would occur along the Strand, Fleet-street, and eastwards; and this route involves the necessity for *reconstructing and reversing the direction of all the branch sewers on the south of the line.*

The ultimate object is the purification of the Thames. *That object cannot be obtained until the channel of the river is deepened, its scouring-power increased, and its mud banks removed by the construction of a proper embankment in conjunction with the scheme of interception.*

Mr. Bazalgette adds,—I beg to state, *that a large amount of risk and capital may be saved, by executing this sewer in conjunction with an embankment along the north bank of the Thames, and that the execution of both these works is essential to the full attainment of the object desired.*

This is not the opinion of the metropolitan engineer alone, but of many of the most experienced engineers in the country; yet this urgent recommendation is passed by, and the fetid mud-banks of the Thames are likely to continue a disgrace—unparalleled by any city on the Continent—a dire disgrace to London, the metropolis of the world. Mr. Bazalgette's voice, however, may not have been raised in vain. The Chief Commissioner has declared that the drainage plans are still to be submitted to the ablest engineers in the country, when Mr. Bazalgette's views may yet find support.

The western district contains about twenty-one miles. The surface is low, much of it being but slightly above high-water mark. Mr. Bazalgette reports,—"In 1854, Mr. Haywood and I recommended for this area, mainly on the score of economy, works for purifying its sewage waters, and then discharging them into the Thames," —instead of conveying the sewage of 21 square miles through the heart of Westminster and London to the Lea. He adds,—"Since then, extensive experiments, which have been made in several places, all tend to confirm the statement, that sewage matter can be separated from the water in which it is dissolved without creating a nuisance, and the water may, by this means, be rendered clean and inoffensive.

"Thus it was that, in the year 1854, we were induced to recommend the construction of sewage works in a suburban locality, removed from houses, viz., in the fields on the banks of the river west of Kensington canal.

"In making that recommendation we assumed the sewage to be valueless; but we had ascertained that the cost of the process of purification would be very much less than that of conveying the sewage to high water at Barking Creek. And this latter circumstance mainly influenced us, although *the increased engineering difficulties attendant on the other scheme* had some share in forming our decision.

"Since the date of that report objections have been raised to the establishment of deodorising works in the locality mentioned."

Whichever plan be adopted, it is proposed to make the western sewer capable of being ultimately extended to Brentford. The sewage of that and of other populous towns in the neighbourhood will, in the mean time, continue to pour their sewage into the Thames above the bridges.

"Supposing the sewage of the western district to be conveyed to deodorising works near the mouth of the Kensington canal, a branch from Chelsea hospital would have to be constructed."

The sewage would be raised by pumping either into the low level sewer, or to the sewage works.

"If it is decided to deal with the sewage locally at the sewage works, it would be raised at the Kensington canal fifteen and a half feet, requiring 153 horse-power. But, if conveyed to the out-fall, it would have to be raised twenty and a half feet, requiring for that purpose 328 horse-power. The cost of pumping, in the latter case, would amount to £15,120 per annum, but only to £8,900 per annum if the sewage were deodorised near Kensington canal.

"The saving effected by not conveying the sewage to the outfall, together with the diminution of engine-power, would amount to £8,059 per annum, advantages which induced me still to recommend the cheaper process. Should the sewage at some future time attain a marketable value, it would go toward liquidating the expenses of extracting it from the water."

The saving on the further extension to Erith Reach will again increase this amount, which, together with the reduced cost of the deodorising process, would now amount to a saving of £12,000 a year on the western district alone, and this may one day be further increased by the sale of the manure.

Having quoted from Mr. Bazalgette's earlier reports his repeated recommendation of the deodorising system for the western district, let me now read an extract from a much later report, dated the 25th September last, after Sir Benjamin Hall had twice rejected, on behalf of the Government, outfalls approved by the Metropolitan Board. He says:—"The approved drainage scheme is capable of being adapted to a variety of outfalls into the Thames, or to the utilisation of the sewage at Barking Creek and Woolwich Marshes, *or even nearer to London, and the Thames thus purified at a less cost*, the reservoirs at those places being dispensed with, substituting for them deodorising works, and discharging the purified waters into the Thames at all times of the tide."

"This process would entirely remove the sewage from the river in a practical point of view. *A further saving of nearly half a million might be effected by terminating the sewers and establishing deodorising works nearer to London*, say in the Greenwich Marshes and the West Ham Marshes, which would accomplish the object desired without creating a nuisance."

Now let us examine whether the deodorisation cannot be better performed elsewhere. Taking first the western district, I will give an outline of the deodorising works as they would be established near the outlet of the Kensington Conal.

1st. The pumping engines would be of a less power than that requisite to raise the sewage into the low-level sewer opposite Vauxhall.

2nd. The deodorising canals, the elevators, and filter frames, would be entirely built in; so that the solid deposit would be discharged direct from the filters into covered barges, without any previous contact with the outer air, and be at once conveyed to depôts on the banks of the river, far beyond the limits of the metropolis.

3rd. Were it decided to flush or scour during dry weather the low-level sewer, passing along the Strand and Fleet-street line, with the effluent water, one deposit canal alone would be employed. But should it be found preferable to discharge it into the river, a second canal, two hundred feet in length, would be necessary; and after passing through it, the effluent stream would be found transparent, and free from taste and smell. The next point at which deodorising works might be introduced is near the river Lea.

The position of these works ought unquestionably to be on the City side of the Lea, the passage over which river, by a tubular aqueduct for the high level, and by a conduit beneath the river bed for the low level sewer, will be extremely costly and difficult of execution.

The expensive extension and the huge reservoir in the marshes would be entirely dispensed with.

The deodorising system might also be applied to the southern drainage scheme by works at Deptford Creek, the pumping-station there proposed being most conveniently situated for the purpose. The necessity would thus be avoided of conveying the sewage from Clapham and Putney to the reservoirs in the marshes, and the sewage of Greenwich might be brought down by its natural fall to the Deptford works, just as the Chelsea sewage was to the western works at Kensington canal, leaving the sewage of Woolwich and the lower part of the line to be treated separately, if at all.

I will now give the estimate of cost for the drainage and conveyance of the sewage down to Erith Reach, as now under the consideration of the Metropolitan Board, and compare it with the same drainage modified by deodorizing works. (See Table in following page.)

Hitherto I have confined myself to showing how easily the system which Mr. Bazalgette himself recommends at the Kensington canal, for an area of twenty-two square miles may be extended to every other part of the remaining eighty square miles of his projected plan. But if I have succeeded in imparting to my hearers a small share of the conviction I myself derive from the success of the Leicester works, and have satisfactorily shown that deodorizing works can be placed, even in the most densely crowded localities, without the possibility of any well-grounded objection being raised against them, it may be asked, whether considerable advantage would not accrue from augmenting their number; and whether, by placing them in the centres rather than at the extremities of the lines of intercepting sewers the consequent diminution of distance,

COMPARATIVE ESTIMATE OF CAPITAL AND WORKING EXPENSES.

Detail of Works adopted by Metropolitan Board of Works.	Estimate by Mr. Bazalgette for conveying sewage to Erith Reach.	Cost of the same drainage with deodorising works.
South Side.		
High level sewer from Clapham to Deptford and branch	£199,226	£199,226
Low level sewer from Putney to Deptford and branch	209,000	209,000
Extension from Deptford to Plumstead	155,550	77,775
Reservoir and land for pumping station	103,140	Land below.
Engine-houses, engines, pumps, &c.	164,780	91,980
(*One pumping saved by deodorising.*)		
North Side.		
High level sewer	129,500	129,500
Middle level sewer and branch	214,200	214,200
Low level sewer, exclusive of the sewer from Western District	253,800	253,800
Western District	78,200	78,200
Main outfall sewer to Barking, reservoir and land	425,800	Land below.
Engine-houses, engines, pumps, &c.	112,000	112,000
Additional cost of conveying sewage from Western District to Barking	348,189	—
Extensions to Erith Reach	443,224	—
Latest estimate—dated Dec. 1, 1856	£2,836,600	£1,365,681
Land, 50 acres at £300		15,000
Deodorizing Works		250,000
Passage over and under the Lea River	?	
Brentford and Acton Extension	?	
	£2,836,600	£1,630,681

Saving in Capital .... £1,205,919.

ANNUAL WORKING EXPENSES.

Mr. Bazalgette's Estimate adopted by the Board	£28,330

DEODORIZING WORKING EXPENSES.

Weekly.

30 Lime Mixers, at 20s.	£30	
75 Filter Press Men, at 20s.	75	
30 Filter Press Lads, at 10s.	15	
10 Reservoir Men, at 20s.	10	
Wages	£130	
Weeks	52	
Wages per Annum	£6,760	
Three Superintendents at £150	450	
Wear and Tear	2,365	
Lime, 26,000 tons, at 12s. 6d.	16,250	
Engine Power rented from Pumping Engines	1,625	
		£27,450

Produce from filter presses, 300,000 tons annually, which, if sold at only 2s. per ton, would cover the working expenses.

£1,205,919, then, would appear to be the amount of capital to be saved by adopting the deodorising system over the whole of the metropolitan drainage scheme; and I will not shrink from comparing my portion of the estimates, step by step, with those adopted by the Board. As far as I can separate the amounts representing the cost of drainage, &c., for the western district alone, they stand thus:—

		If Deodorised.
Metropolitan estimates for drainage	£78,000	£78,000
Additional cost of conveying sewage from western district to Barking alone	348,180	
On to Erith (*cost unknown*)		
Deodorising works at the Kensington canal (Population 151,950)		21,000
	£426,180	£99,000

to which the sewage would be conveyed, might not enable their size to be reduced, and their inclination to be increased, so as to ensure more perfect scouring. I have already said how heartily I concur in all Mr. Bazalgette has urged in reference to the Thames embankment, and the impossibility of ever arriving at the complete purification of the river, or at a wholesome and respectable state of its shores, unless that very necessary undertaking be carried out. I go further, and maintain that the embankment itself should enclose the deodorizing canals, the vaulted roofs of which would form a platform available for roads or any other purpose.

The embankment, in fact, is a key to the whole position. It will cut off the communication between the present sewers and the river, and, at the same time, furnish, without disturbing the streets, not only a site for deodorizing the sewage waters, but the best site, namely, one at or near the present mouths of the sewers, whilst the works would offer no interference to the roads, quays, or warehouses erected over them.

The capital required to carry out any system for unprofitably conveying the sewage of the metropolis down the river, would, in conjunction with the funds produced by the new wharves and docks, suffice to effect this great undertaking Until the embankment was considerably advanced, the sewers entering the Thames between London and Westminster Bridges would continue as now to pour their filth into the river, but all the enormous sewers above and below the bridges might at once be purified by the erection of local works which could be brought into operation within six months from the time at which the ground was placed in the hands of engineers. How many years must otherwise elapse before any portion of the metropolitan sewage will be directed from its present course.

One striking advantage in treating the sewage locally is, *the facility which it offers for meeting, at any future time, the necessities of an increasing population in any particular district.* On Mr. Bazalgette's plan, preparation is to be made *at once*, at an enormous increase of expense, for an addition of one million to the present population, an estimate which never may be realised, or at least not in the quarters anticipated.

Nothing that I have proposed would interfere with the high and middle level intercepting sewers, works comparatively inexpensive, and offering no engineering difficulties. I would only observe, that the sewage conveyed by those sewers should be treated locally, and the purified water, when needed, supplied during dry weather to the flushing of the lower and less rapid system of sewers.

Although several members of the Metropolitan Boards have visited the works at Leicester for their individual satisfaction, the authorities of the metropolis have not attempted to acquaint themselves on better ground than hearsay evidence, with the facts which have resulted from the Leicester experiment. It is a reproach to all parties that no official knowledge is possessed upon a subject which is associated at Leicester with such changes in the Bills of Mortality, as are exhibited by the report of the Officer of Health.

High scientific opinions are not wanting in support of the system. I will read the following letter in proof of what I state:—

"Chemical Laboratory, Guy's Hospital,
September, 15th, 1851.

"Sir,—We have read with great attention your pamphlet, describing the patent process for producing solid manure from sewage water, and think that the plan which you proposed for collecting the sewage of towns and speedily converting it to a profitable and useful manure, excellent.

"The chemistry is properly explained, and the descriptions clear and intelligible.

"We can state of our knowledge, and from our own experiments, that by your process the nitrogenous organic matter, as well as the phosphoric acids, dissolved or undissolved, would go down and be retained in the solid deposit; while the water, after the precipitation is completed, will be discharged in a limpid state, and free from the offensive matter which it previously contained.

"The avoidance in your process of long exposure to the air, and the absence of artificial heat, ensures the separation, in the best manner, to prevent loss of the fertilising matters contained in the sewage water.

"We consider your process has, in fact, these advantages

over every other plan which has been proposed—it provides for the immediate and rapid sewerage of a district at all periods; it prevents the contamination of a river, or other sources of water supply by removing all noxious animal and vegetable matters; it provides for a speedy deodorisation, separation, and drying, of the solid and useful parts of the sewage; and, lastly, it furnishes to the agriculturist a cheap and useful manure.

"Wishing you success in a practical form,
"We are, yours, very truly,
"ARTHUR AIKIN, F.L.S.
"ALFRED S. TAYLOR, M.D., F.R.S.
"Professors of Chemistry, in Guy's Hospital."
"T. Wicksteed, Esq., &c., &c."

With such opinions and results in favour of the system, I demand, on public grounds, that further inquiry be made into the facts which I have alleged. Let chemists be appointed by the Government to analyse the sewage water at every stage of the operation; let a commission be appointed to visit and examine deliberately and frequently the works at Leicester, at all hours, and judge whether the results herein stated have been exaggerated, and if they are found to be fully borne out, let not the provisions of the act of 1855 be tortured into preventing the admission of limpid water into the Thames, when no objection has hitherto been raised to the discharge into the river of storm waters, which after passing for miles in common sewers cannot be remarkably pure and inodorous.

That ordinary sewage has high manuring properties is universally admitted, and I have shown how it may be employed, both economically and without contaminating the atmosphere. Again, the cheap manure in which the deposit can be produced in a solid form, yet promises to render its manufacture self-paying if not even lucrative. For my own part, I think that ultimately such will be the case. But farmers are slow in appreciating the value of any manure that does not possess strong fertilizing properties, and the quantity produced must for a time exceed the demand. Its value, however, for compost or "nitre beds" is beginning to be appreciated, which alone will open a wide field for its employment. Above a thousand tons have been taken by the farmers near Leicester during the past week, and further applications have been made, but at a very low price. Leaving the question of marketable value, my object this evening has been to represent the great facitities for, and advantages in, deodorizing the sewage water of the metropolis before putrescence is in full activity, and the restoration of the water either in a pure state to the river, or the use of it after deodorization for the purposes of inoffensive irrigation. That the sewage water can be sufficiently deodorized and purified by lime alone without causing the slightest nuisance, is a great fact, and I can see nothing but prejudice or penuriousness that can prevent its adoption.

DISCUSSION.

The Chairman said it was now his duty to invite discussion upon this subject. At the present stage he would only say that he agreed with the author of the paper in the importance of the question being solved as to the beneficial application of the sewage of the metropolis, and the prevention of its entire waste. When they recollected that the whole system of vegetable and animal life depended one upon the other—that vegetables lived upon carbonic acid, water, ammonia, and certain mineral substances—that these afforded food to animals during life, and were again resolved, by the effete matter during life and decay after death, into the same substances, viz., carbonic acid, water, and ammonia, it was not, he thought, a wise policy on the part of the metropolis to send away all that matter to feed sea-gulls and sea-lions, in order that it might be brought back again from Ichaboe in the form of guano. Instead of this general and wasteful distribution of our treasures throughout the world, it would be far better to use them economically and productively at home. He would mention one philosophical fact. The effete matter of a population was of all things just the thing to supply as manure for the growth of the food of that population. The Irish fed very much upon potatoes, and potatoes grew well in Ireland, because the effete matter of the potato feeder was exactly suited for the growth of that crop; and, in like manner, the population of the metropolis of this country would be best provided with food suited to it by the application of the sewage of the metropolis to the land. The 12,000 tons of nitrogen consumed in the food of its inhabitants was capable of being applied to the growth of a similar representative of food if we followed Nature's teachings. He was in the first instance surprised at the statement that the inhabitants of London, in maintaining their vitality, consumed about 12,000 tons of nitrogen annually: but, ignorant of the mode of arriving at this result by Mr. Cooke, he had made the calculation on his own data, and came to the result of 11,768 tons, which was very near the amount stated in the paper.

Mr. J. B. Lawes said, that he read before this Society, about two years ago, a paper upon the sewage of London, in which he expressed an opinion that it would not be possible, by any process hitherto discovered, to manufacture a solid manure from sewage, which should be remunerative both to the manufacturer and to the agriculturist. This subject was very fully entered into at that time. Indeed, the interest taken in it was so great, that the Council of the Society was kind enough to devote an extra night to the discussion. Mr. Wicksteed's pamphlet was then before the public, in which he endeavoured to show that a profit of 22 per cent. could be obtained upon a capital of one million, by applying to the sewage of London that process which had since been carried out at Leicester, and described this evening by Mr. Cooke. Mr. Wicksteed considered that his solid manure would sell for £2 to £2 13s. 0d. per ton. It was, however, argued by him (Mr. Lawes) and others, that the chemical composition of the manure would not justify Mr. Wicksteed in assigning to it a greater value than a few shillings per ton. It must be gratifying to those who, like him (Mr. Lawes), considered that the value of any manure could be determined by its chemical composition, to find that this opinion had been confirmed that night by Mr. Cooke. This sewage deposit was no longer a valuable artificial manure, but it was to be ranked with lime, chalk, clay, &c. Mr. Cooke had said, "that it would find purchasers at a low price, when it could be obtained at an easy and short carriage; and that, by judicious arrangements, it might sell for rather more than it costs." The great objection to Mr. Wicksteed's process was this, that while increasing the sewage by an enormous bulk of worthless matter, it failed to arrest the greater portion of that which was most valuable in the sewage, which, consequently, flowed back into the sewers or rivers. It was well known to chemists that lime would not precipitate ammonia or its salts from a liquid containing them. Mr. Cooke endeavoured to meet the objection by saying, that in using Mr. Wicksteed's process they did not deal with highly putrescent sewage abounding in ammonia. Professor Way, however, held a different opinion; he examined sewer-water from places in the centre of London, from Barret-court and Dorset-square, and stated that all the nitrogen in the liquid state seemed to be in the form of ammoniacal salts; that in one case 84 per cent., and in the other 89 per cent. of the whole ammonia in the sewage existed in the soluble state. While, therefore, he (Mr. Lawes) might lament, with Mr. Cooke, that thirty million pounds worth of ammonia had gone to waste in the City of London during his life, he (Mr. Lawes) could not admit that this waste would be stopped by the application of Mr. Wicksteed's process. Mr. Cooke had, perhaps wisely, abstained from furnishing an analysis of his manure, but he (Mr. Lawes) would, however, venture to quote one which had lately been given him by Professor Voelcker, Professor of Chemistry to the Royal Agricultural College, Cirencester:—

Analysis of Leicester bricks made from the sewage of the town of Leicester, by Mr. Wicksteed's Lime process.

Water	10·52
Organic matters	12·46
Oxides of iron and alumina	2·89
Phosphate of Lime (bone earth)	2·27
Carbonate of Lime	52·99
Sulphate of Lime	1·76
Carbonate of magnesia	3·67
Potash	0·26
Chloride of Sodium	0·45
Insoluble siliceous matter	13·50
	100·77

And containing nitrogen equal to 0·60; ammonia, 0·72.

Now, here was a substance containing 80 per cent. of matter to which it was impossible to assign any money value, and containing not more than 16 or 17 lbs. of ammonia in a ton. What could be done with 300,000 tons of this substance, the annual amount which would be produced if Mr. Wicksteed's process was applied to the London sewage? It certainly could not be sold, and it was doubtful whether it would be taken as a gift. He (Mr. Lawes) could hardly think that the Chief Commissioner of Public Works would consider himself justified in permitting deodorising works to be erected in the metropolis, from which 8 or 9-tenths of the ammonia in the sewage operated upon would flow back into the sewers or river, more especially as ammonia was the element which, more than any other, was supposed to be the vehicle of miasma and contagion. He (Mr. Lawes) considered that the proper mothod of using sewage was by irrigation. If, however, it was found impossible to select any district upon which the fluid could be deposited, he was disposed to join in the cry of those who say, away with the sewage to the German ocean.

Mr. E. Chadwick, C.B., said that, on the statement made by Mr. Cooke, that "it behoved the authorities generally to consider whether the effluvium from an extensive area saturated with sewage, poisoning the atmosphere by putrifying and steaming during the heat of the summer, might not be as injurious to the health of Kent, aye, to the metropolis itself, as the most efficient subterranean removal of sewage might be beneficial," it was to be observed that by one set of authorities, at the least, the foundation of such apprehensions had been carefully examined, and provisions made to meet them; and it was, doubtless, the duty of those who had the responsibility of new works to re-investigate the subject, and to examine the works in actual operation. The first scheme for applying the sewage of the metropolis to other towns was proposed by the late Mr. Smith, of Deanston, and was simply an application of the practice at Edinburgh of applying it by submersion. The result of the investigation of the Board of Health was to establish sanitary objections to this system, as well as objections of an agricultural and economical nature. The deodorising power of soils might be illustrated by such common facts as that, when the cook had an "oniony" knife, it was the practice to put it in garden mould, where it was soon perfectly deodorised. But by Professor Way, and by Mr. Huxtable, those deodorising powers of the soils had been demonstrated scientifically and experimentally, by passing sewage, or mixtures of decomposing animal or vegetable matter, through a sufficient stratum. Most persons who lived in the neighbourhood of the parks, at the period of top-dressings, had been annoyed by the foul odours arising from this operation. Indeed, he had known frequent illness occasioned by them. Similar evils were at times experienced during the heavy dunging and top-dressings of market-gardens with decomposing animal manures. Great loss also ensued; agriculturists agreed that two-thirds, or three-fourths, escaped in a gaseous form. The mode of preventing this loss and nuisance was not to apply chemicals, but simply to perform the work of disintegration at once by putting the solid manure into water to arrest the gases, and applying it by the water-cart or by steam-power. This process was in fact a saving one. Mr. Beach, a market gardener, at Isleworth, had given proof, in prize fruit and vegetation, of its special advantages. The application of those principles to the disposal of the refuse of towns in the prevention of nuisances, was now proved in a sufficient number of instances. It had been done at Rugby now for three years. In respect to the drainage, it was to be observed, that those who only knew sewage under the old conditions, as decomposing manure from the overflow of cesspools or house drains, where it had been detained for weeks, months, or years, were unaware of the new conditions of town drainage, in which all cesspools were abolished, self-cleansing tubular house drains and sewers being substituted, and the refuse removed at once, before it could become decomposed. At Rugby, all refuse was immediately removed by the new self-cleansing drainage and sewers, and afterwards distributed by steam-power on the principle of the water-cart. The results of the working were in complete accordance with the principles and facts to which he had adverted. The sewage was at once received in the soil, and held there, not merely in mechanical suspension, but in chemical combination, until it was taken up by vegetation. The effect was shown in the pellucid and usually inodorous condition in which the surplus water ran away on days when there was no rainfall. The sanitary conditions and the agricultural conditions, were, as he (Mr. Chadwick) conceived, inseparable, and the instance cited would be found to demonstrate that where land was available, they might be satisfactorily established by this method. But, whilst it operated to arrest decomposition, and deodorize the refuse of towns, and to prevent a nuisance, by a speaker at the Great Metropolitan Board of Works, and in writings of persons advocating particular interests, this very case had been held forth as an instance of the creation of the nuisance. On this essential point he must claim to adduce the authentic declaration of Mr. Walker himself, made in April last, in a letter in answer to one of those writers. Mr. Chadwick then read a quotation from the letter. Besides the sanitary results demonstrated, this particular instance tended, in connexion with other evidence, to settle the extent of area required for the application of the sewage of a town population. At present the ordinary sewage derived there from a thousand houses, was directly applied to about five hundred acres, by pumping, without any storeage; and there was an end to sewer marshes, or sewer lakes; but it sufficed only for an average of three or four dressings during the year. Mr. Walker, though satisfied with the results as they were, was of opinion that the refuse might be absorbed on half the area; and it appeared that two hundred acres of ordinary drained land would suffice to utilize the sewage of one thousand houses. On such a scale the sewage of the whole of the metropolis might be utilized on an area of ten miles square. Where land was obtainable, and he confined his objection to such a case, the intervention of such a process as that proposed, was, he considered, an unnecessary expense, a waste of engineering work, of chemical matter, and a loss and deterioration of manure.

Mr. G. F. Wilson, F.R.S., said, having seen the works at Leicester in operation, he could bear testimony to the apparent perfection of the numerous mechanical arrangements there, and to the complete manner in which the sewage was deodorized and disinfected. The chemical part of the process was less complete: through the undecomposed nitrogenous matter, some compounds of urea, such as the oxalate and nitrate phosphates, soap suds, and some other good manure could be saved by the lime process, precipitation, and filtration, yet ammonia, when once formed, could not be so. He thought, however, that in one chemical point of view the lecturer had not done Mr. Wicksteed's process justice; though lime would not fix ammonia, other bodies known to chemists would; and there was no doubt that greater chemical knowledge applied to the subject would introduce those bodies either in substitution for, or in addition to, the lime—magnesian limestone, for example. Now it seemed to him that Mr. Wicksteed's process and apparatus afforded the great present good of rendering sewage entirely innoxious and inoffensive; the further, though less important, present good, of separating a considerable portion of the fertilizing matter; and the great future good of supplying in operation a beautifully complete apparatus, with appliances for precipitation, for conveying out the precipitate, and its separation, by filtration, from the water with which it was mixed, all at once available when the body to fix the ammonia made its appearance. Now he (Mr. Wilson) could not think, even if the chemical knowledge would allow it (and we had now great scientific chemists) that the common sense of the country would not interfere to prevent any such monstrous plan as that by which the enormously valuable matter of the London sewers would be carried and allowed to run to waste into the German Ocean. If we waited until a combined mechanical and chemical process arrived at perfection, we should wait for ever. How did great manufactures rise? When a process had attained a moderate degree of perfection, it was put into operation; then improvements after improvements were naturally suggested. The great thing was to get a good practical starting point, and the meeting would, he thought, agree with him that Mr. Wicksteed had, at the very least, advanced thus far at Leicester.

Mr. S. Sidney said this was the third time that the value of sewage manure had been discussed by the Society of Arts. On the first occasion, he (Mr. Sidney) characterised as wild exaggerations the poetical view which Mr. Mechi took of the refuse of cities. On the second occasion, Mr. Bennet Lawes, in a most able paper, exhausted the chemical part of the question, and came to the conclusion, that a distant limited application of sewage manure to grass land in a liquid state, was its only profitable use; and now Mr. F. Cooke, in his very candid paper, was content to take manufactured solid sewage, at from 2s. to 4s. per ton, a price that would not bear the cost of carriage, as he (Mr. Sidney) had shown in former discussions. This theory of the enormous value of town sewage was not new. The late ingenious Mr. Smith, of Deanston, was the author of a theory, that town sewage could be converted into a source of revenue—a theory which the late Board of Health had employed, in order to bribe many towns to enter into costly and unprofitable schemes of town drainage. In 1848, Mr. Smith, of Deanston, in a report circulated under the authority of the Board of Health, wrote—"Assuming that 5 cwt. of sewer water is equal to 2½ cwt. of guano—that the sewer water of every town was worth £1 per head per annum (that would give three millions sterling for London); and that, therefore, 'such an income annually would provide a fund for the improvement of all towns in a manner corresponding with the most enlightened views with respect to sanitary regulations.'" A very little inquiry served to show, that while 2½ cwt. of guano was worth 30s., and would produce an increase of six bushels of wheat per acre over ordinary crops, the same quantity of sewage water was all but valueless. Nevertheless, in the first report of the Board of Health, dated July, 1849, it was said, "That in the local works which it is necessary to execute for the sanitary improvement of towns, an entirely new system of sewerage must be combined with a new system of house drainage, with a new system of water supply, and with a new system of removing and of applying the refuse of towns to agriculture." And Local Boards of Health were recommended to enclose waste land, "drain, and lay down upon it pipes for the distribution of the sewer manure, and then re-let it, prepared for cultivation, with a supply of the manure, on lease, and apply the surplus rents to the sanitary improvement of the town." In 1853, Mr. Chadwick addressed a letter to the Home Secretary, in which he stated that there were ten towns where inoffensive and beneficial distribution, by flexible pipe and jets, might be anticipated at an early date; and, in 1856, the same gentleman read a paper at the Free Trade Congress of Brussels, in which he spoke of a hundred towns in such a manner as to lead to the belief that they were about to derive crops and revenue from their sewage.—[Mr. Chadwick dissented.]—At any rate, such was the impression of Mr. Walker, of Rugby, of himself (Mr. Sidney), and many others. In this paper, at least, two examples only of enlightened cultivation were cited—the well-known liquid manure farm, of 170 acres, at Tiptree (where his worthy friend, Mr. Mechi, never grew good corn crops, or good root crops, until he followed the example of his neighbours, and gave his wheat 30s. an acre of solid guano, and drilled in a good dose of Lawes' superphosphate with his mangold), and the sewage manure farm of Mr. Walker, at Rugby, where, on 200 acres of grass land, on a wonderfully porous soil, a very good effect was produced by the liquid sewage in summer. Here, then, after all, were just two towns, or, rather, villages, using town sewage on the Deanston plan, Watford, where the machinery did not as yet work successfully, and Rugby. But the sewage manure theorists maintained that the absence of demand for the fertilising streams of cities was to be attributed to the stupidity of the British farmer. But had the farmer been standing still during the last sixteen years? During that period a million sterling had been invested in manufactories for producing annually hundreds of steam engines, threshing machines, drills, horse-hoes, clod-crushers, ploughs, harrows, &c., which were eagerly bought up. During that period millions had been sunk in draining, paid for by farmers' rents; hundreds of thousands of tons of guano, costing from £10 to £15 a ton, had been consumed. Manufactories of another costly manure, superphosphate of lime, had been established in every great town and every agricultural district. These manufacturers imported bones, bone ashes, and burned flesh from South America; they ransacked even the battle-fields of Europe for the same invaluable material; they imported apatite from Norway; and they did all this while sewage lay at their doors, offered to them gratis, and yet they did not find it worth while to accept it. After bringing forward other instances in support of his views, Mr. Sidney said that in thus following out the history of British agriculture it was impossible to doubt that the profitable use of liquid manure must depend on special and exceptional circumstances, as, for instance, where it could by gravitation be cheaply applied to grass land, of a quality sufficiently porous to absorb it. At Rugby it flowed away rapidly enough; yet even there it could not be all used, and the river was polluted. But few soils were like that of the Rugby farm. If he were asked why we neglect British, and send so far for Peruvian guano, at more than one hundred times the price of the home production, he would answer, why do we drink China tea instead of British herbs, Eastern sugar instead of British honey? Why do we wear American cotton and Italian silk, instead of British home-spun? Why do we prefer rosewood to British oak? Why toast our friends in foreign champagne instead of the domestic gooseberry? Because the foreign article was cheaper at the higher price.

Mr. Sheriff Mechi begged to state, in a very few words, the results of his own practical experience on this subject, and, in the first place, he would remark, that the earth was the best and cheapest deodoriser that they had. So effective was it that where he had applied large quantities of liquid manure of the strongest description, saturated with the dead bodies of animals in large quantities, he had found his cattle feeding upon the pasture so treated within twenty-four hours after the application, and forty-eight hours after, no smell whatever was emitted. Again, with respect to liquid manure not being good for other crops than those of grass, he had found it beneficial to every description of crop, and so effective that, where it was applied in considerable quantities, he had seen its effects on subsequent crops for three or four years. Having a piece of land undone, and comparing it with that which was done, the result had been unquestionable for several years. If they doubted the power of the soil as a deodoriser, they had only to get some game that was high, wrap it in a cloth, and cover it with a few shovels-full of earth, and, in half an hour, they would find that all unpleasant smell was removed. A labourer in his employ had assured him that when he used to be engaged in cutting up carrion for feeding hounds, the only way in which he could remove the smell from his hands was by washing them in clay water. But before they could apply liquid manure to clay lands they must be well drained. On chalky, gravelly, and sandy soils, they might put any quantity of liquid manure with effect, especially for those quick-growing crops which consumed large quantities of food by their rapid growth. But the great question was, to persuade the agricultural public that it was to their interest to use this description of manure. If sewage was profitable to be used by the farmer, it was useless unless the agricultural public were prepared to lay down the pipes to bring it upon their land. This could be done at a cost of something like £6 per acre. Having adopted the system himself, he could state as the result of his experience for the last four years, on his farm of 170 acres, that it was a most profitable operation. Applying the water of London alone—even without the 12,000 or 15,000 tons of ammonia—over properly drained land, would be profitable. The water meadows of Winchester and the Duke of Portland proved this. It had been said that liquid manure was not available during wet weather or frost. He would say that it could be applied in any weather except very severe frost, and even during frost it often had the effect of softening the ground. He hoped never again to hear it asserted that water cannot percolate through the stiff clays, for unless that notion were exploded, it was in vain to hope that agriculturists would apply the sewage of towns upon clay lands. The cost of its application was no longer a matter of doubt. There was a vast amount of prejudice to be got rid of before sewage manure would be of extensive application. Of its value there could be no question. London at the present time contained about an eleventh part of the population of the whole country, and probably the produce of one-eighth of the whole area of land was exhausted to feed London alone. The importance of a good manure would be fully appreciated by those who had to resort to expensive foreign manure to supply the exhaustion of the land in feeding the population of this metropolis. With regard to the deodorising process at Leicester now advanced, he would state that it was contemplated to carry it out at Chelmsford; originally it was intended to lay down a system of pipes and works for the purpose of irrigating the land, but there was at present a difficulty in obtaining the land required for the purpose on such terms as would justify the outlay.

Dr. **Copeland** remarked, that in his opinion, if Mr. Bazalgette's plan of intercepting sewers were carried out, it would be a failure, injurious to the health of the metropolis, and would entail double the estimated expense. The subject of deodorising—or, more properly speaking, disinfecting—was one of great importance; for, unless that were done, no sanitary improvement would result. He objected to the use of quick-lime in the process, inasmuch as it set free the ammonia, whereas he would suggest the use of carbon (carbon being a fixer of ammonia), and the result would be a more useful manure. That was, however, objected to by Mr. Cooke, on the score of expense. In 1849, a patent was obtained for peat charcoal; it had been extensively employed, and was sold in Ireland at 1s. per bushel. This might be thought a high price for agricultural purposes, but if combined with other chemical materials it might, he thought, be advantageously used for disinfecting the sewage before it reached the larger reservoirs, or even in the reservoirs themselves. He thought that a mistaken notion prevailed as to the injurious effects that would result from these sewers, for he had reason to believe that the effects were not so bad as when the sewage was spread over the surface of the land. No doubt, as Mr. Sheriff Mechi had stated, the earth was the best deodoriser, but the great object was to deodorise long before the sewage reached that destination.

Dr. **Glover** said, that time did not admit of his speaking at any length on the subject, but he believed that deodorising processes might be carried out with success, and that the fact of several very impure waters being purified by filtration, was a proof of it. The great object should be to employ materials which were themselves excellent as articles of manure, and which, by absorbing the sewage, would become still more so. Dr. Glover referred to the experiment of M. Chevalier on animal charcoal as a deodorising agent, and stated that he himself had experimented on soot, and found it a powerful deodorising agent. He also referred to the action of sulphate of lime as a fixer of ammonia, and in conclusion stated that he believed the problem, though difficult of solution, was by no means impracticable.

Mr. **Wright** said, although a member of the Metropolitan Board of Works, he was not there to defend that body. It was a favourite practice to point out in strong language the enormous amount of fertilising matter that was lost under the ordinary system of town sewage. He appealed to the chairman, as a chemist, and one acquainted with manufactures, whether the cost at which it could be saved was not an essential element in the question. Quartz might contain gold, but in so small a proportion that it would not pay the expense of extraction. He applied that remark to the subject before them. Until it had been shown that it would cost less to abstract the valuable matters in the sewage than the value when extracted, they must adopt the best plan they could for getting rid of it. He would instance ammoniacal liquor of gas works. The ordinary strength of that product in gas works was, that it took about 16 ounces of sulphuric acid to saturate a gallon of the liquor, and thus form a salt of ammonia. It was more profitable to sell it for a low price to parties who took it away from the gas works and manufactured from it a valuable chemical salt, than for the gas company to attempt the manufacture themselves. But the manufacture could not be carried on profitably if the dilution exceeded a certain per centage. Now the per centage of ammonia in sewage was infinitely less than in any ammoniacal ever made. He had hoped for more detailed facts as to the expenses at Leicester. If, as was stated, they were selling it at 2s. per ton, could they buy lime for the process at 2s. per ton? Those were the practical questions which required to be answered. He thought, that after the diversity of opinion they had heard that evening, to ask the Metropolitan Board to rush into this scheme, would be asking more than practical men of business would be inclined to concede. The Board of Works were doing all they could to bring the sewage to one or two points, and when there it could be operated upon. He would appeal to this large audience, whether what the Board were doing was not something like that which business men should do?

Mr. **Wilkinson** said he belonged to an increasing section of the Metropolitan Board, who believed that in deodorising would be found the successful solution of the great question of the day. He contended that they had nothing to do with the commercial consideration of the question. The question was how they could most efficiently, in a sanitary point of view, effect the complete drainage of the metropolis. The Board of Works might be considered as a jury upon the question, and they wanted evidence to guide them. He could confirm all that had been stated by Mr. Cooke with regard to the sanitary effects of that system upon the town of Leicester, and the process might be carried on under their drawing-room windows without offence to any one. He considered the most magnificent results had ensued in a sanitary point of view from the adoption of the deodorising process; and as the representatives of the sanitary interest of the metropolis, it was the duty of the board to pause before they committed themselves to the vast expenditure proposed. They ought officially to send proper persons to examine carefully into this process. He (Mr. Wilkinson) was not wedded to any particular plan, but he believed that the deodorising principle would enable them to do the work most effectually and economically. He considered that it ought not to be thrown upon the Board of Works to determine this great question; it would be more satisfactory if a special commission were appointed for a work of such magnitude, which commission should embrace the best engineering and chemical talent of the day. He dissented from the opinion just expressed, that because the products were not at present commercially valuable, the deodorising principle ought not on that account to be considered by the Metropolitan Board.

Mr. **Rawlinson** said that it was now pretty well decided that towns must be sewered, and houses must be drained, if health was to be preserved, and for that purpose the accumulated sewage must be disposed of; and as there were cases in which an immediate application to the land could not be made, some form of deodorising would be necessary. He (Mr. Rawlinson) could only say, that if the Leicester plan did not fully answer the purpose he was sorry to hear it, and most earnestly hoped all objections might be removed. Mr. Cooke had imputed the saving of life in Leicester to the deodorising. As this might be objected to, he begged to say that sewers and drains, without the deodorising works, had brought about equally beneficial results, and he only mentioned this fact that the arguments in favour of deodorising might not be weakened. The question should not be one of cost alone; if absolutely necessary to the health and comfort of the people, the work ought to be made compulsory, and a rate should be levied for the purpose of defraying the expenses. Much had been said about the proposed metropolitan works, and their great cost—if great works were to be carried out, the cost must be great, but not greater than the benefits to be conferred.

Dr. **Letheby** said, as the Medical Officer of Health for the City of London, he had looked with great interest at every scheme which had been advanced in order to effect the complete drainage of the metropolis, and he, in common with others, had devoted considerable attention to the question raised as to the effect of lime upon the sewage of the metropolis. Without entering upon the engineering part of the subject, he would direct his attention to the two chief arguments that had been advanced in favour of the scheme then brought before their notice. One related to the chemical influence of the lime. The constituents of the sewage of towns consisted for the most part of undigested matters, and when those were acted upon by lime—whether they were in an undecomposed state, or in a putrescent state, the lime precipitated the phosphates, which, in the act of falling, carried mechanically other matters existing in sewage waters, and there were left urea, uric acid, and other substances of value, wholly untouched. The process, therefore, he considered deficient in the first principles of chemistry. He need not say that the action of lime upon the various constituent matters of sewage water was well known to chemists; but he had himself put it to the test of experiment, and he found that lime acted upon the sewage matter, whether fresh or in a decomposed state, in such a manner that the great material which gave its value to guano—ammonia—passed away, and was lost. The lime did little more than precipitate the matters mechanically suspended. Another argument was, that the mortality of the town of Leicester had been very considerably reduced since that mode of disinfecting the sewage had been introduced. The tabulated return before them would at first sight indicate that fact, and if they relied upon it, they might conclude that the health of the town had progressed, *pari passu*, with the introduction of this system. But let them look at the other towns in the North-Midland counties, and they would find that there also, in precisely similar proportion, had there been an improvement in the state of the public health. By the returns of the Registrar-General for the last three years, he found that the improvement in the health of Leicester—upon which so much stress was laid, as connected with this particular system—was precisely the same as that which had taken place throughout the whole of England; thus the argument failed. He was therefore of opinion that the two points to which he had directed his remarks, viz., the chemical principle involved, and the sanitary result claimed, were not founded upon those sure data on which such schemes ought to be based, in order to gain attention as applicable to the exigencies of the metropolis.

Mr. **Cooke** said that the length of the discussion and the lateness of the hour would only admit of a very brief reply to the comments of the various gentlemen who had addressed the meeting. It had been said that he had ascribed the diminished number of deaths at Leicester to the system of deodorisation alone; but that was an error. He had ascribed this all-important fact to the general sanitary measures adopted at Leicester. It was true the putrid river Soar of former days had, since the erection of the deodorising works, become a pure stream of wholesome water, and the sickly residents on its banks had become healthy. This was a remarkable coincidence, at least. It had been said that quicklime liberated the ammonia of the sewage, and that the Leicester plan was, therefore, chemically wrong. He (Mr. Cooke) had stated that it was cream, or hydrate of lime, that was employed, and that the ammonia, in consequence, could not be, and was not, liberated by the process. It had been said that the chemist of the Agricultural College at Cirencester declared that in the dry bricks there was only ·72 per cent. of ammonia. He (Mr. Cooke) had shown that the dry brick lost its ammonia, and should not be taken as the product of the system. It had been said that the process was a fallacy, and the product worthless, because it did not sell. He (Mr. Cooke) had stated that it did sell, at a price that covered the outlay in production, and that 1,000 tons had been sold in the last fortnight. He was told that there was a fallacy in valuing the ammonia in manure at £60 per ton, as that was the price of the pure article. He replied, how, then, was guano valued? It contained sixteen per cent. of ammonia, and sold in the market in proportion to the quantity of ammonia in the sample. He was charged by a member of the Metropolitan Board with trying to force his plan upon the board. It was not his plan, but that of the board—of their engineer, Mr. Bazalgette—who recommended it for the western district, because "he had ascertained that the cost of the process of purification would be very much less than that of conveying the sewage to Barking-creek." That this circumstance mainly influenced him, although the increased engineering difficulties attendant on the other scheme had some share in forming his decision, and that the amount of saving in that district alone would be £12,000 per annum; and Mr. Bazalgette afterwards stated that if his (Mr. Cooke's) proposition for deodorising at the Lea river were adopted, "a further saving of nearly half a million might be effected." It was said that the plan had failed at Southampton. This was an error.

The authorities had not adopted the plan, and their putrid sewage flowed into their stream at low tide, but he thought they would ultimately adopt it. Another gentleman urged that the English farmer would only use the pure guano, on the same ground that in private life tobacco was used instead of rhubarb leaf, coffee instead of chicory, champagne instead of gooseberry wine. He (Mr. Cooke) replied that that gentleman was wrong in each case. The counterfeit was extensively used because it was cheaper, but the deodorised sewage was no counterfeit; it was of low value, but still of value, and sold at the low price at which it could be produced, and for what it was worth. He (Mr. Cooke) showed, by sales that were going on, that it could be disposed of at a price which would cover working expenses, but the Metropolitan Board were willing to spend £38,000 per annum, without any return. He showed a saving of £1,200,000 per annum on the engineers' estimates. Another gentleman declared that irrigation was desirable, but that it infected the air. He (Mr. Cooke) submitted a plan for purifying the sewage water before it was employed for irrigation. He was told that the ammonia escaped in the effluent water, but the chemists could not detect it. Another gentleman, a member of the council, said that he (Mr. Cooke) had not done full justice to Mr. Wicksteed's plan, which had proved three great points, viz., that the feculent matter was separated by it without any nuisance, that the deposit was removed from under the clear water without exposure to the atmosphere, and that it was converted into a solid substance, easily removed, and of some value. He said that therein the main question was solved. He (Mr. Cooke) urgently warned the agriculturists of this country not to be led blindly by the chemists. They had been the best and truest advisers, but they would be found to be bad masters. Twenty years had passed since he had had to fight the cause of a great and novel undertaking, when the very mention of the electric telegraph was laughed at, and when he had not the great facts achieved to point to which he had in this instance. But truth would gain its victory, as it did then, and the scientific prejudices once overcome, the scientific adviser became the best and safest friend. The Leicester system was a great fact, which could not be shaken. Its adoption in London, under the guidance of experience and science, would be a great gain, and it was his (Mr. Cooke's) conviction that it would ultimately be adopted.

The Chairman said it only remained for him to move a vote of thanks to Mr. Cooke for his very valuable paper. With reference to the discussion that had taken place, he would allude to a matter in which he had been personally appealed to by one of the speakers, viz., that this question ought not to form a large subject of investigation because capital had not yet used it for speculative purposes. The whole history of manufactures was but the using up of waste materials for a long time unrecognised by capital, but which ultimately had produced the most important benefits to mankind. If such were the result of manufactures, surely the opinion of chemists that this material contains valuable properties for the food of our population, ought to receive more attention from capital, and they ought not to be deterred by any general statements that sewage manure could not be made valuable. He thought Mr. Cooke's advice, to refer the question to a commission of scientific men was better than that he had employed in his reply. He quite agreed that whilst they ought not to allow scientific men to be their masters, they ought to make scientific men their advisers. In carrying out the electric telegraph, Mr. Cooke, who knew much of the science of the subject, did not hesitate to avail himself of the scientific discoveries of other persons, or to employ their counsel in guiding him, and it was this, united with his own energy and power of business, which had led to such a successful result. The fact of his being in the chair had prevented him taking part in the discussion, but he did not wish to be supposed to be committed to a full approval of the plan before them. He, however, agreed that it ought to be further investigated, in which he thought scientific men could aid with their information in deciding the question whether this plan was one that could be economically adopted, or whether—economical or not—it could be adopted with safety to the community. This was a legitimate subject for scientific investigation, and for the counsel of scientific men.

A vote of thanks was passed to Mr. Cooke.

The Secretary announced, that on Wednesday next, the 17th inst., a paper by Professor Owen, F.R.S., "On the Ivory and Teeth of Commerce," would be read.

The following letters have been received since the meeting:—

"Sir,—There was no time for practical farming men to make any observations last evening, otherwise I should have stated that since I have been engaged in farming on rather a large scale (farming 560 acres), I have been constantly studying all the different modes now known for manuring and enriching my land at the least cost; and with respect to the manure made by Mr. Wicksteed's process, I should say that it is with the farmers merely a question of cost. If Mr. Wicksteed's solid manure contains ·73 per cent. of ammonia and 12 per cent. of animal matters (as the analysis of Mr. Voelcker proves) then one ton of it is worth to the farmer as much as 100 lbs. of guano; and if the farm is near to the works, it may be cheaper for him to buy and distribute on his land 3½ tons of this manure, than 3 cwt. of guano; but that cost depends, of course, on the distance and expense of carrying this manure on to his fields. The great advantage of applying liquid manure by pipes, is the small cost of its distribution, as the engine will pump up and distribute manure at a cost of 1½d. per ton; whereas the carting of solid manure alone from the farmyard on to the fields and distributing it, will cost 4s. per ton. Also, when the manuring principle is applied to land dissolved in water, it permeates more rapidly through the soil, and becomes more quickly combined with it, than when put on the land in a solid state; and until the manuring principle has chemically combined with the soil, the food for plants is not produced. Professor Way has shown us, by one of his most valuable experiments, that when liquids, containing ammonia, are filtered through six inches of earth, containing such usual proportion of alumina as all corn lands have, all the ammonia is retained and chemically combined with the alumina, and the liquid is discharged free from it, wherefore it is more desirable to apply the manure dissolved in water, and, as is now the custom, to apply guano to the land in wet weather, that its ammonia may be quickly washed in; and I may here remark, in answer to one gentleman's observations, that Mr. Way has found that peat charcoal has not so good an effect in arresting ammonia from liquids as common earth, and it is therefore of no value for that purpose.

"If I could get a supply of liquid manure brought to my farm, I should be glad to receive it, and would distribute it over my land; but until that can be done, I see no reason why farmers should not use Mr. Wicksteed's solid manure, if its cost per ton, when put on the land, will not exceed the cost of 100 lbs. of guano. But, of course, if by Mr. Wicksteed's process the per centage of ammonia can be increased, its value to the farmer will also be greater.

"I am, &c.,
JOHN BETHELL."

"Sir,—In Mr. Cooke's paper of yesterday it was asserted 'that Mr. Wicksteed was the inventor of the lime process for deodorising and precipitating sewage.'

"As long since as 1847 a court of inquiry, consisting of the chairman of the meeting, Dr. Lyon Playfair, together with Sir Henry de la Beche, and one or two others, examined into my own invention on this subject, and reported, 'That it was a proper subject for an Act of Parliament,' which act was passed in the same year. Mr. Wicksteed was on that occasion heard by counsel before that court, which, however, decided in my favour.

"It was impossible for me last evening to call attention to my claims, which, however, I trust you will allow to appear in the same *Journal* which contains the report of last evening's proceedings. By so doing you will much oblige "Yours, &c.,

"WILLIAM HIGGS.

"24, Churton-street, Pimlico, Dec. 11, 1856."

HONORARY LOCAL SECRETARY.

The following gentleman has been appointed Honorary Local Secretary for Manchester:—

George Peel, Manchester.

EXAMINATION PRIZE FUND.

The following addition has been made to the Prize Fund:—

Sir J. W. Ramsden, Bart., M.P., £105.

Home Correspondence.

REMARKS ON MR. C. BINKS' PAPER.

Sir,—I was much surprised, on reading Mr. C. Binks' interesting paper "On some New Methods of Treating Linseed Oil," &c., to find that he had so completely overlooked several valuable memoirs which have been published on the very subject of his discourse, not only as to the method of investigation, but also the very substance he recommends to impart to linseed oil *rapid drying* properties. No one less deserves the following sweeping remarks of Mr. Binks than my master, M. Chevreul:—"But the labours of Chevreul went to determine their chemical constitution, not to investigate their peculiar changes under all kinds of extraneous action, and the peculiar chemical history of the changes the drying oils undergo formed no part of his admirable researches;" for M. Chevreul began to investigate fully the phenomena of the drying of oils in 1845, and published a most extensive and valuable paper in the Memoirs of the Academy of Sciences, 1850; and Mr. Binks cannot plead that this paper could not be known by him, for, after I gave my lecture at the Government Department of Science and Art, Marlborough House, Mr. Hart kindly undertook to make an extract of it, which he published in several numbers of the *Builder*, see Vol. XIII., pages 109, 193, 243, and 373, 1856. If Mr. Binks will read M. Chevreul's Memoirs, he will find that this learned chemist investigated the drying properties of oils exactly by the method claimed by Mr. Binks, and he will find that M. Chevreul made and described several hundred experiments. My master not only examined the various atmospheric influences which assist or impede the drying of linseed and other drying oils, but also the action of the same when boiled with litharge, or oxide of manganese, the influence of various pigments on the same, and lastly, the action which various surfaces have in facilitating or retarding the drying of oils.

As to the employment of the hydrate of protoxide of iron, or nickel, and especially that of hydrate of protoxide of manganese, for imparting at natural temperatures, or at a moderate heat, drying properties to linseed oil, Mr. Binks will find a paper by Messrs. E. Barruel and Jean, published in the *Chemist*, Vol. IV., p. 412, 1852 and 1853, in which those gentlemen recommend the above hydrated oxides for the above purposes, and, what is not less extraordinary is, that the very explanation of the mode of action of these hydrates of protoxides in determining the rapid drying of linseed oil, is identical with that given by Mr. Binks as his own.

I am, &c.,

F. CRACE CALVERT.

DRYING OILS.

Sir,—The desire to hear what the manufacturers of boiled oil and varnish had to say on the subject of Mr. Binks' paper, and the lateness of the hour, prevented my making any remark, as a consumer of both articles, as to their present defective points.

All persons interested in their use must hail with satisfaction the prospect of being able to procure a pale or colourless drying oil at a moderate price, difficult as it is to believe that mixing an oil of nearly the colour and consistence of treacle, will not injure the purity of white and other delicate paints; the mere opening a discussion on the subject, and giving consumers an opportunity of expressing their wants, will probably lead to improvements. In fact, it appears that the difficulty of procuring a colourless drying oil, has prevented varnish makers making any considerable improvements in copal varnishes for carriages during the last thirty years. From all the information I can obtain on the subject, the only advance made during that time, is, that many manufacturers can now produce as good an article at a lower price, as was only made by one house thirty years ago; the colour is still dark, and injures delicate paints.

At the time I was occupied in preparing the report on the carriage department of the Paris Exhibition last year, and obtaining information connected with the details of manufacture, I found exhibited by Messrs. J. Colin and Co., of Breslau, Silesia, samples of pale drying oils, prepared in three manners.

First, with borate of manganese.
Second, with phosphorus.
Third, without heat.

Can Mr. Binks inform us if he has tried any of these methods, or will any manufacturer try them, and give us the result of his experiments?—I am, &c.,

GEORGE N. HOOPER.

28, Haymarket, Dec. 5.

TECHNICAL WORDS.

Sir,—As I am about to publish a Supplement to my "English Dictionary," I shall feel much obliged to any Members of the Society, or readers of the *Journal*, who will favour me with additional words, and particularly trade terms.—I am, &c.,

HYDE CLARKE.

42, Basinghall-street, 6th Dec., 1856.

THE PRICKLY PEAR.

Sir,—The juice of the fruit of the prickly pear, the *Cactus opuntia* of some botanists, and *Opuntia vulgaris* of others, which you forwarded to me some time back, with a request to ascertain its properties as a dye, has, so far as the quantity sent would admit, been submitted to different trials upon cloth, both woollen and cotton, without mordaunts and mordaunted.

The juice, although of itself a beautiful deep, rich, purple rose colour, did not, under any circumstances, convey this tint to the material with which it was tested.

Cotton cloth prepared with different mordaunts took up colour in a very imperfect manner. The shades varied according to the mordaunts employed, and were from a grey to a brownish black. All were of a dull hue, and unstable, being removed to a large extent by boiling with water only, consequently of little or no value.

With woollen cloth mordaunted I was more successful, and with a mordaunt of a tin salt I secured a bright blue black colour, which was comparatively stable, and resisted considerably the soap bath. I am sorry to say, however, that time has the effect of changing the colour of this cloth. The piece accompanying this, and which you will notice is of a dull brownish purple colour, was the same which I exhibited to you about six weeks back, and was then, as you may remember, of a rather beautiful blue black. I am, &c.,

DUGALD CAMPBELL.

7, Quality-court, Chancery-lane, Dec. 4, 1856.

BRUSSELS ECONOMIC EXHIBITION.

SIR,—I find that I was misinformed when I stated, in my report on the Brussels Exhibition of Domestic Economy,[*] that the article on the Building Department, which I quoted from the *Builder* of Oct. 4, was by H. Roberts, Esq., the honorary secretary of the Labourers' Friend Society. I am not aware by whom that article was written, but I am told that the sum allotted by the French Government towards the erection of workmen's houses in France was 10,000,000f., instead of 1,000,000f.

I am, &c.,

T. TWINING, Jun.

Perryn House, Twickenham, Dec. 3, 1856.

EXAMINATIONS.

SIR,—A letter appears in the *Journal of the Society of Arts* of Friday last, in which the writer expresses his regret that the Council have resolved to exclude certificated masters from their examinations.

It seems to me that three reasons may be assigned to justify them in coming to such a decision:—

1. It is unnecessary to provide examinations for that portion of society.

2. It would be unfair to those for whom the examinations have been established.

3. It would tend to bring the Society of Arts into direct collision with existing institutions.

The intention of the Council has been to supply a want of the age, and whilst they keep this object steadily in view they will not fail to command the respect and support of the more thoughtful part of the community.—I am, &c., ROBERT HONEY.

Cowper's House, Huntingdon, Nov. 24, 1856.

RAILWAY ALARM FOG-SIGNAL.

SIR,—My attention was engaged to make an improvement in alarm-signals for railways in consequence of the terrible disaster on the railway near Straffan, in Ireland, nearly three years ago. Colonel Beamish, director of the Cork and Bandon Railway, had six fog-signals placed on the rail at the Cork terminus, and when the engine passed over them two or three failed to explode. I requested that one, which was not tested, should be opened, and I found that the gunpowder within was *caked*, as if from damp, the three iron nipples were rusted, and the percussion caps on them rendered defective from verdigris; the circular tin case was also nearly eaten through with rust. Recollecting that the composition with which I charged my rifle percussion-shells, as far back as the year 1823, made a louder and a sharper report than any gunpowder I could find, I thought this composition—equal parts by weight of chloride of potass and sulphide of antimony, both pulverised—would be the best adapted for charging my fog-signals, which are made of paper, varnished over to make them water and damp-proof; they are exploded by means of my patented glass tube-ignitor, which cannot take rust or become impaired by any length of time in keeping. The weight of my signal is not quite *half* that of the tin signal now in use, while its report is louder and sharper.

I am, &c.,

J. NORTON.

MEETINGS FOR THE ENSUING WEEK.

MON. London Institution, 7. Dr. Tyndall, "On the Nature and Phenomena of Light."
Architects, 8. Mr. Owen Jones, "On the Leading Principles which appear to reign in the Composition of Ornaments of every period—from the Grammer of Ornament."
Chemical, 8. Mr. A. G. Anderson, "On the Saponification of Resin."
TUES. Civil Engineers, 8. Anniversary.
Linnæan, 8.
Pathological, 8.
Statistical, 8.
WED. London Institution, 8. Conversazione.
Society of Arts, 8. Professor Richard Owen, F.R.S., "On the Ivory and Teeth of Commerce."
Geological, 8. I. Captain Spratt, "On the Tertiary Freshwater Deposits of the Western Portion of the Grecian Archipelago." II. Mr. John Wolley, "On an Ice-carried Boulder at Borgholm." III. The Rev. Mr. Clarke, "On the Occurrence of Volcanic Bombs in Van Dieman's Land." IV. Dr. Richardson and Mr. E. Browell, "Analysis of Waters from the Turko-Persian Frontier." V. Messrs. Hillier and Moyle, "On some Minerals from Siam."
THURS. Royal Society Club, 6.
Numismatic, 8.
Antiquaries, 8.
Philological, 8.
Royal, 8½.
SAT. Asiatic, 2.
London Institution, 3. Mr. T. A. Malone, "On Experimental Physics, chiefly in Relation to Chemistry."
Medical, 8.

PATENT LAW AMENDMENT ACT.

APPLICATIONS FOR PATENTS AND PROTECTION ALLOWED.

[*From Gazette, November* 28*th*, 1856.]

Dated 14*th November*, 1856.

2691. John Sutherland, Paddington—An improved railway break.
2692. Henry Clarke Ash, 11, Park Place South, Chelsea—Improvements in railway signals.
2693. Dan Saul, and Peter Williams, Swinton, Lancashire—Certain improvements in machinery or apparatus for spinning and doubling cotton and other fibrous materials.
2694. Andrew Symington, Kettle, Fife, N.B.—Improvements in apparatus for drying yarns and woven fabrics.
2695. Christopher Binks, City of London—Improvements in converting iron into steel, and in giving a coating of steel to iron.
2696. Archibald Reid, Sidmouth-street, Regent-square, and Charles O'Neil, Golden-square—Improvements in treating metallic ores to obtain copper.
2697. John Crawley, Wood-street, Cheapside—Improved machinery for stitching fabrics.
2698. James Greaves, Gerrard-street, Soho—An improved construction of ladies' side saddle. (A communication.)
2699. John Aitken, Islington—Improvements in the furnaces employed in the manufacture of iron or other metals.

Dated 15*th November*, 1856.

2700. Nicolas Pierre Joseph Leseure, 29, Rue de l'Echiquier, Paris—An improved embroidering machine.
2701. Henry Hawes Fox, 17, College-hill—Improvements in manufacturing brushes.
2702. Deane John Hoare, Mortimer-street, Cavendish-square—Improvements in the manufacture of iron.
2703. Robert Mushet, Coleford, Gloucestershire—Improvements in the manufacture of iron.
2704. Andrew Barclay, Kilmarnock, Ayrshire—Improvements in the manufacture of iron.
2705. George Davies, 1, Serle-street, Lincoln's-inn—An improved paper suitable for the filtration of liquids, the dressing of wounds, and for the manufacture of envelopes, bags, bands, and for other similar purposes. (A communication.)
2706. John Billing, Abingdon-street, Westminster—Improvements in chimneys.
2707. George Pye, Ipswich—An improvement in treating and bleaching cotton.
2708. Henry Blackburn, Butterworth Hall, near Rochdale—Improvements in billies and mules for slubbing and spinning wool, cotton, or other fibrous materials.
2709. John Drew, Back-hill, Middlesex—Improvements in library tables or desks.
2710. Nathan Robincon, John Lister, and Henry Stevenson, Bradford, York—Improvements in looms for weaving.
2711. Christopher Binks, London—Improvements in the manufacture of iron and steel.

Dated 17*th November*, 1856.

2712. Thomas Cope, Liverpool—Improvements in tobacco-cutting machines.
2713. Alexandre Marie Joseph Eeckman, Lille, France—A mechanical bakery and cookery.
2714. Joseph Worthington, Manchester—An improved mode of signalling from the guard to the engine driver on railway trains.
2715. Constnatin Michel, Lyons, France, and Isidore Antoine Maret, Paris—Making atmospherical observations.

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[*] *Journal of the Society of Arts*, Vol. IV., p. 781.

2716. William Hawkes, Birmingham—A new or improved machinery for applying steam power to the ploughing of land, and other agricultural operations.
2717. Esteves Blanchon, Blois, France—Machinery and apparatus for marking and boring leather and other similar substances, for making and cutting screwed pins, and for uniting leather and other similar materials. (A communication.)
2718. George Jones and Joseph Reece Jones, Liverpool—An improved life-boat.

Dated 18th November, 1856.

2719. John Wilson, West Bromwich, Stafford — Improvements in springs for railway and other carriages.
2721. Samuel Cunliffe Lister, Manningham, near Bradford, York—Improvements in spinning.
2722. Frederick Arthur Magnay, Taverham Mills, Norwich—Improvements in damping paper for printing.
2723. Richard Butterworth, Chelsea—Improvements in the means of securing the ends of rails for railways.
2724. Samuel Dyer, Bristol—Improved mechanism, applicable to propelling ships and vessels, applicable also as power machinery for ships' purposes.
2725. John Grieve, Bank-park, Tranent, Haddington—Improvements in chimney cans.
2726. Henry Bessemer, Queen-street-place, New Cannon-street—Improvements in the manufacture of iron.

[*From Gazette, December 5th*, 1856.]

Dated 13th September, 1856.

2142. Edward Green, Wakefield—Improvements in scrapers employed to cleanse boiler tubes and flues for economising fuel.

Dated 25th October, 1856.

2512. Heinrich Hochstaetter, Darmstadt—Improvements in obtaining instantaneous light.

Dated 7th November, 1856.

2624. Amos Holt and Jabez Bentley, Cardigan Mill, East Ardsley, near Wakefield—Improvements in machinery for weaving stuff and other goods.

Dated 15th November, 1856.

2681. The Honourable William Erskine Cochrane, 5, Osnaburgh-terrace, Regent's-park—Improvements in the permanent way of railways.

Dated 19th November, 1856.

2727. William Brindley, Moorgate-street—Improvements in the treatment and application of papier maché for covering floors, roofs, and other like useful purposes.
2729. Henry John Distin, 31, Cranbourn-street, Leicester-square—Improvements in cornets and other wind musical instruments. (A communication.)
2730. William Smith Churchill and James Bradshaw, Stalybridge, Cheshire—Improvements in machinery or apparatus for drying yarns or fabrics, applicable to machines for sizing or dressing yarns or threads to prepare them to be woven.
2731. John Jones, Middlesborough-on-Tees, Yorkshire, and Edward Jones, Liverpool—Improvements in the manufacture or production and treatment of metal castings.
2732. John Lord, Rochdale—An improved admixture or compound to be employed as a substitute for oil in the treatment of animal wool preparatory to "carding."
2733. James, Earl of Caithness, Barrogill-castle, Caithness, N.B.—Improvements in driving belts, straps, or bands for machinery, and in the application and use thereof.
2734. William Edward Newton, 66, Chancery-lane—An improvement in centrifugal pumps. (A communication.)
2736. George Watson, Manchester, and Cornelius Satterthwaite, Preston—Improvements in the manufacture of fire lighters.
2738. Alfred Watson and Alfred Hamlyn Williams, Cornhill—An improved cap or top for scent bottles.
2739. Samuel Fox, Deepcar, Sheffield—Improvements in machinery for drawing wire and tubes.
2740. Louis Adolphe de Milly, Paris—Improvements in the manufacture of fatty acids.
2741. Samuel Fox, Deepcar, Sheffield—Improvements in heating steel wire and tubes, also ribs and stretchers of umbrellas and parasols for hardening, and in apparatus for straightening wire and tubes.

Dated 20th November, 1856.

2742. Edwin Salt, Bolton-le-Moors—An improved paper-cutting machine.
2743. James Montgomery Gilbert, Manchester—Improvements in certain machines for etching or engraving.
2745. Peter Armand le Comte de Fontainemoreau, 39, Rue de l'Echiquier, Paris—Improved apparatus for preparing carbonic acid gas and impregnating liquids therewith. (A communication.)
2746. Charles François Jules Fonrobert, Berlin—Improvements in the manufacture of boots and shoes. (Partly a communication.)
2747. Charles François Jules Fonrobert, Berlin—Improvements in the manufacture of insulated wires for electric telegraphs. (Partly a communication.)
2748. Thomas Francis Joyce, Birmingham—Improvements in joining, supporting, and strengthening the rails of railways.
2749. William Morgan, 48, Gloucester-terrace, Hyde-park—An improvement in heating parts of cylinders and other hollow bodies of iron to a welding heat.
2750. Robert Brock Benson, New York—Improvements in reefing sails.
2752. Richard Eaton, 2, Sussex-terrace, New-road, Battersea—Improvements in apparatus for buffing on railways, and for other purposes.

Dated 21st November, 1856.

2753. Louis Dartois, 39, Rue de l'Echiquier, Paris—An improved machine for the cleansing of textile and fibrous substances.
2755. John Norman, Liverpool—Improvements in propelling navigable vessels.
2757. John William Clare, White-street, Saint George the Martyr, Surrey—Improvements in preventing, removing, consuming, and condensing smoke and noxious vapours, and in apparatus for those purposes.
2759. Fréderic Ludewig, Paris—An improved leaven.
2761. William Edward Newton, 66, Chancery-lane—Improvements in machinery for spinning or twisting fibrous substances. (A communication.)
2763. Joseph Barrans, New Cross, Surrey—Improvements in apparatus for applying oil or lubricating fluid to the axles of railway carriages and locomotive engines.
2765. Richard Archibald Brooman, 166, Fleet-street—A method of and preparation for rendering textile and other like fabrics sanitary and disinfecting agents. (A communication.)
2767. Thomas Roberts and John Dale, Manchester, and John Daniell Pritchard, Warrington—Improvements in obtaining and purifying oxalate of soda, which improvements are also applicable to the manufacture of oxalic acid.

Dated 22nd November, 1856.

2769. William Thomas Henley, St. John's-street-road, Clerkenwell—Improvements in electric telegraphs, and apparatus connected therewith.
2771. Alexander Robert Terry, 24, Great George-street, Westminster—Improvements in sawing, splitting, cutting, and binding kindling wood.
2773. Edward Tucker, Belfast—Improvements in preparing and drying glue and gelatinous matter.
2775. Richard Archibald Brooman, 166, Fleet-street—Improvements in the manufacture of artificial wines, or beverages to be substituted for wines, and in apparatus for aiding fermentation. (A communication.)
2777. William Edward Laycock, Sheffield—Improvements in looms for weaving.

Dated 24th November, 1856.

2781. George Salt, Saltaire, Yorkshire—Improvements in weaving carpets and other piled fabrics.
2783. James Kennedy Martin, Dundee, Forfar, N.B.—Improvements in hoisting or purchase apparatus for ships and vessels.
2785. Charles John Lewsey, Albion-terrace, Commercial-road East—Improvements in sugar-cane mills.
2787. Henry Brickley, Stratton, near Cirencester—Improvements in mills for grinding.
2789. John Orr, Glasgow—Improvements in the manufacture of pile fabrics.

Dated 25th November, 1856.

2793. Henry Bougleux, Leghorn—Improvements in the construction of steam-boilers.

WEEKLY LIST OF PATENTS SEALED.

December 5th.

1359. William Denny Ruck and Victor Touche.
1365. Robert Ferrier.
1366. James Holdin.
1367. James Holdin.
1389. Rd. Archibald Brooman.
1407. Hypolitte Mège.
1411. Peter Armand le Comte de Fontainemoreau.
1464. Charles Minne and Amand Colson.
1466. Jean Charles Lefevre Lacroix.
1477. Edwin Hardon and Joseph Henry.
1487. Jules Etienne Lafond.
1505. David Macdonald.
1609. Alfred Vincent Newton.
1701. James Lawrence Crockett.
1705. James Lawrence Crockett.
1792. Robert Thatcher.
1793. John Knowles and William Buxton.
1913. William Tranter.
1923. Thomas Scott
2229. Richard Husband.
2235. James Cottrill.
2281. Henry Jenkins.
2378. Frederick Albert Gatty.

December 9th.

1369. John Ellis.
1370. Benjamin Smith and William Kalthoff.
1378. Perceval Moses Parsons.
1384. William Henry Westwood, Thomas Wright, and Edward Wright.
1399. William Massey.
1495. Robert Wilson Chandler and Thomas Oliver.
1513. Andrew Shanks.
1604. Frederick William Hoffman.
1606. Julien François Belleville.
1712. Rd. Archibald Brooman.
1765. George Spence.
1831. Thomas Green.
1861. Alexandre Théodore Nicolas Goll.
2030. Alfred Vincent Newton.
2115. Stephen White.
2265. David Law and John Inglis.
2298. Alfred Vincent Newton.

PATENTS ON WHICH THE THIRD YEAR'S STAMP DUTY HAS BEEN PAID.

December 1st.

2812. Jonathan Saunders.

December 2nd.

2834. William Edward Gaine.
2906. Samuel Messenger.

December 4th.

2823. Matthew Andrew Muir.
2865. Richard Eccles, John Mason, and Leonard Kaberry.
2872. John Bourne.
2891. Wm. Frederick Plummer.
2951. Auguste Edouard Loradoux Bellford.
2964. Archibald Thomson.

December 5th.

2837. Julian Bernard.
2839. Alfred Vincent Newton.

December 6th.

2846. William Thomas Henley.
2860. Arthur James.

Journal of the Society of Arts.

FRIDAY, DECEMBER 19, 1856.

FIFTH ORDINARY MEETING.

Wednesday, Dec. 17, 1856.

The Fifth Ordinary Meeting of the One Hundred and Third Session was held on Wednesday, the 17th inst., J. Griffith Frith, Esq., in the chair.

The following Candidates were balloted for, and duly elected members of the Society:—

Allnutt, Henry, C.E.
Brook, John
Brook, William
Carlile, James William
MacGregor, John
Pillischer, M.
Ritchie, George Robert
Routledge, Thomas
Shelburne, Earl of, M.P.
Spray, Frederick
Walters, Robert
Wethered, the Hon. John
Wrigley, Joseph, jun.

The following School has been taken into Union since the last announcement:—

Bayswater Grammar School.

The Paper read was:—

THE IVORY AND TEETH OF COMMERCE.

By Professor Owen, F.R.S.

All the parts of animal bodies are, at their beginning, in a state of fluid. In this *plasma*, or formative fluid, there are numerous points or centres which, from subsequent phenomena, may be called centres of attractive or assimilative force, antagonised by centres of repellant or excretive force. The first organic forms observed, as the consequence of the co-ordinated operations of these modes of force are minute vesicles with usually central parts or nuclei, and called cells or nucleated cells. By the properties and actions of these cells, the different elements in the plastic fluid are selected, localised, and specially arranged for the formation of the future organs. Some aggregate the albuminous principle, to form the nervous system—others, the fibrinous principle, to form the muscles—others, the gelatinous principle, which becomes the basis of a vast variety of organs. The blood may be regarded as the continued and somewhat modified formative plasma, meandering or circulating in specially organised tubes, or through the interspaces, and in the substance, of the several tissues and organs. Certain parts, which have the gelatinous principle for their basis, possess the property of combining with that basis the mineral or earthy elements contained in the plasma, or blood. Some of these tissues consolidate themselves by the addition of pure flint; others—and the majority—by the addition of salts of lime,—either lime in combination with carbonic acid, or lime in combination with phosphoric acid, or with varied proportions of both salts, and with the addition, in a few cases, of fluate of lime. It is these consolidated, hard, resisting textures of animal bodies that have been found of most use in the arts. They are known by the names of bones, and shells, coral, and ivory. Art, however, derives a small amount of profit from the calcified or silicified tissues of dead animals compared with that which Nature avails herself of. They subserve and are essential to her in some of her mightiest operations on the surface of this earth. The countless and widely diversified species of soft gelatinous polypes, by the power which they possess of selecting from the surrounding ocean and arranging in their own frail tissues the lime which is ever being carried into the ocean by the rivers that drain the land,—by the chemical power which they at the same time possess of adding to that soluble caustic lime the carbon which results from the low combustion of their vital action—relieve the sea of that mineral element which in excess would prove noxious to animal life, and at the same time lay the foundation of those enormous masses of carbonate of lime which constitute the coral islands and coral reefs that are met with in most of the tropical and warmer parts of the ocean. These examples of calcified animal tissues, after having been subjected to the mechanical action of the surf-waves, to the chemical influences of volcanic heat, and to those changes of position which are due to the expansive and upheaving forces of the same plutonic agency, become those fertile tracts of dry land which form the chalk cliffs and the limestone rocks of actual continents.

The uses which man derives from analogous calcified parts of animal tissues are comparatively few and insignificant. There is a certain commerce in shells which are used for the purpose of cameo works and other ornaments, and a smaller amount of traffic in certain forms of corals. The bones of the vertebrated animals, which are hardened, not like shells, by carbonate, but principally by phosphate of lime, are used largely in certain chemical operations. A few bones, from their greater degree of density, are serviceable for mechanical purposes; but the calcified tissue of highest value in the arts, and which, from the earliest periods of human history, has been the object of chief research for ornamental purposes, is ivory. This term is properly applied only to the substance which forms the main body of the long, projecting, hornlike teeth, called *tusks* in the elephant.

Ivory is the principal subject which, agreeably with the request that I have been favoured with by the Council of the Society, I have selected for the few observations which I shall have the honour to make this evening. I wish it were in my power to deduce from the results of the numerous and minute researches of anatomists and physiologists into the structure and mode of growth of this valuable substance, ivory, any conclusions which might lead to procedures calculated to improve its qualities, or which might be suggestive of aught that might tend to increase the quantity and diminish the price of ivory. But I am compelled to admit that the researches of science do not, in this particular, lend any efficient aid to the arts in reference to ivory.

The substance of the teeth of other animals besides the elephant is an article of commerce. Formerly, the name ivory was given to the main substance of the teeth of all animals; but it is now by the best anatomists and physiologists, restricted to that modification of dentine or tooth-substance which, in transverse sections or fractures, shows lines of different colours or striæ proceeding in the arc of a circle, and forming by their decussations minute curvilinear lozenge-shaped spaces. By this character, which is presented by every the smallest portion of an elephant's tusk in transverse section or fracture, true ivory may be distinguished from every other kind of tooth-substance, and from every counterfeit, whether derived from tooth or bone. It is a character—this engine-turned decussating appearance—which is as characteristic of fossil as of recent ivory. Although, however, no other teeth except those of the elephant present the characteristic of true ivory, there are teeth in many other species of animals which, from their large size and the density of their principal substance, are useful in the arts for purposes analogous to those for which true ivory is used; and some of these dental tissues, such as those of the large tusks of the hippopotamus, are more serviceable for certain purposes, especially in the manufacture of artificial teeth, by the dentist, than any other kind of tooth-substance.

The utility of teeth in commerce and the arts depends chiefly on a peculiar modification in their laws of growth. For the most part teeth—as in our own frames—having attained a certain size and shape, cease to grow. They are incapable of renewing the waste to which they are liable through daily use, and when worn away or affected by decay, they perish. Certain teeth in man and the majority of the mammalia, are succeeded by a new tooth after the old one is worn away and shed, but this, with very few exceptions, occurs but once in the course of life. Teeth of this kind are said to be of limited growth, but there are other teeth, such as the front teeth of the rat, rabbit, and all the rodent tribe, the tusks of the boar and hippopotamus, the long descending canine tusks of the walrus, the still longer spiral horn-like tusk of the narwhal, and the ivory tusks of the elephant, which are endowed with the property of perpetual growth, that is, they grow as long as the animal lives. In the case of teeth of limited growth, the formative organ may be said to have a short life. In the case of teeth of unlimited growth, the life of the formative organ is coequal with that of the individual. The formative organ or matrix of a tooth, consists of a soft conical *pulp*, similar in shape to the first formed summit of the tooth. It is enclosed in a membranous bag, which is reflected from its base. This bag is called the *capsule*. In some teeth there is a third soft organ which is between the bag and the pulp, and connects them for a greater or less extent together. Each of these three soft parts of the matrix—the pulp, the capsule, and the intervening substance—has its own peculiar structure and mode of action upon the blood that circulates through it, by virtue of which it selects certain hardening or earthy principles—chiefly phosphate of lime—and deposits the particles thereof after a fashion peculiar to itself—whence result different dental tissues. That which is formed by calcification of the pulp is called *dentine*: that which is formed by calcification of the capsule is called *cement*: the intermediate substance, when present, forms the *enamel*.

In teeth of unlimited growth fresh pulp, fresh capsule, and in some instances also fresh enamel-organ are formed and added to the pre-existing constituents of the tooth matrix, in proportion as these are calcified or converted into tooth substance; and as fast as the ivory and enamel may be worn away from the summit of such a tooth, will ivory and enamel be formed at its base, and thus the growth of the tooth is uninterrupted. The ratio of the addition of the formative principles is at first greater than the ratio of abrasion, and the tooth not only grows, but increases in size. When, however, the animal has attained its own full growth, the tooth for the most part is reproduced without increase of size, or at most augments only in length, and that in cases where its summit is not perpetually worn down by being opposed to that of an opposite tooth.

The tusks of the hippopotamus, like the incisors of the rodents, are maintained of a certain definite shape, by being opposed to one another, but the tusks of the walrus and of the elephant, as it would seem, through the absence of opposing teeth, acquire proportionately greater length, exhibiting, indeed, the largest size to which teeth attain in the animal kingdom, and with these preliminary remarks upon the calcified tissues of animals in general, and on the general laws of dentition in the mammalian class, I proceed to the specific subject of the present discourse, which is the structure and formation of the teeth of the elephant, from which true ivory is derived.

Now, I may observe, that in the present creation elephants are restricted to the African and Asiatic continents. The African elephant, as is well known, is a distinct species from the Asiatic one, and some of the Asiatic elephants of the larger islands of the Indian Archipelago—as those of Sumatra—if not specifically distinct from the elephants of Continental Asia, form, at all events, a strongly marked variety. With reference, however, to the commercial relations of ivory, it is chiefly worthy of notice that in the Asiatic elephants, tusks of a size which gives them the value of ivory in commerce are peculiar to the males, whilst in the African elephants, both males and females afford good-sized tusks, although there is a sexual difference of size in this species, those of the males being the largest. In former times, and, as it would seem, before man existed to avail himself of this beautiful animal substance for use or ornament, the large quadrupeds furnishing true ivory—proboscidian quadrupeds, as they are termed, from their peculiar prehensile nasal appendage—were much more widely spread over the globe, and existed in far greater numbers than at the present day—more numerous in individuals—more numerous in species—manifesting so great diversities in the conformation of their grinding teeth, as to have led the naturalist and the palæontologist to divide them into two genera, called *elephas* and *mastodon*. A true elephant roamed in countless herds over the temperate and northern parts of Europe, Asia, and America. This was the creature called by the Russians, mammoth; it was warmly clad with both hair and fur, as became an animal deriving its sustenance from the leaves and branches of trees which grow as high as the 65th degree of north latitude.

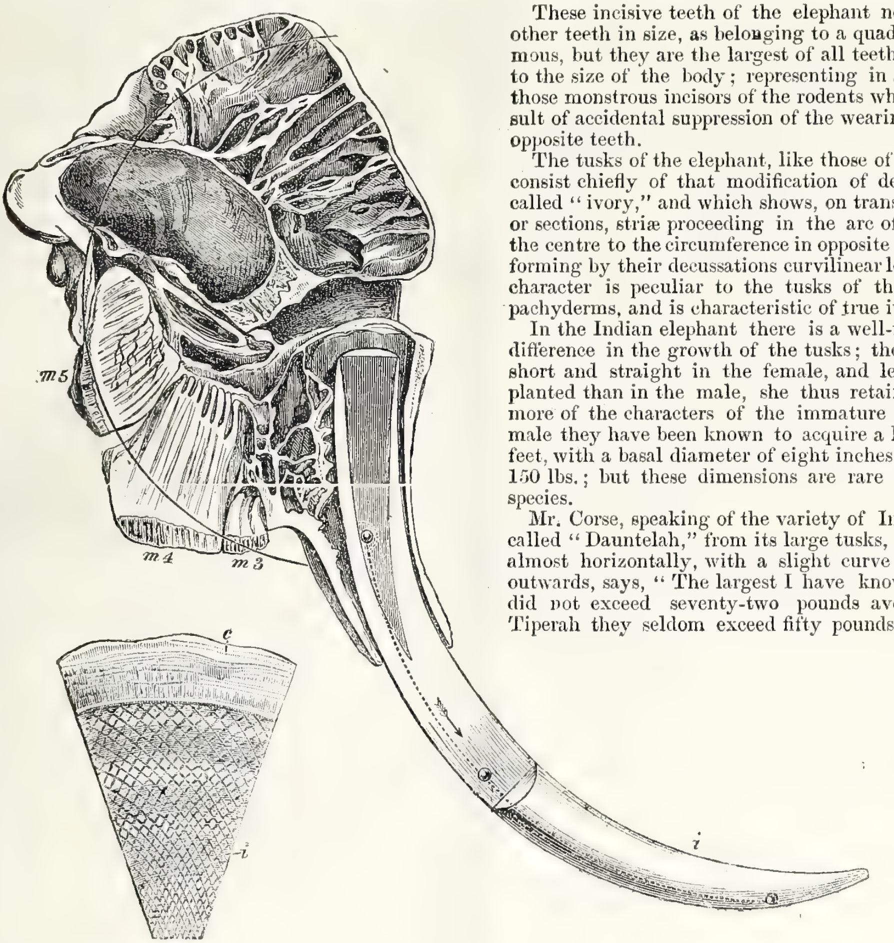
Some of the ivory of commerce is, or used to be, derived from the tusks of this extinct species, of which the individual found frozen, with all its soft parts and integuments, in the icy soil of Siberia, may be known to all. Then, there was an elephant of Southern Europe and Asia Minor,—a mastodon peculiar to the temperate and warmer parts of North America,—another species of mastodon in Central America, and two or more mastodons in South America. Australia appears likewise to have had its great proboscidian ivory-producing quadruped. The number of extinct elephants and mastodons which formerly existed in tropical Asia, and which have been restored by Cautley and Falconer, has surpassed all anticipation. No imagination can calculate the quantity of the valuable material of ivory that has been formed and has perished on this earth prior to the period of human history. At the present day, commerce is reduced to seek for that precious commodity in the tropics of the two continents—Africa and Asia. It is, of course, from our intimacy with the two existing species that our knowledge of the nature of ivory has been chiefly derived.

The dentition of the genus *Elephas*, the sole existing modification of the once numerous and various Proboscidian family, includes two long tusks (See *i* in the annexed figure), one in each of the premaxillary bones, and large and complex molars (*ib. m* 3, *m* 5, *m* 2) in both jaws: of the latter there is never more than one wholly, or two partially, in place and use on each side at any given time, the series continually being in progress of formation and destruction, of shedding and replacement; and, in the elephants, all the grinders succeed one another, horizontally, from behind forwards. The total number of teeth developed in the elephant appears to be—

$$d\,i\,\frac{1-1}{0-0}\quad i\,\frac{1-1}{0-0}\quad d\,m\,\frac{3-3}{3-3}\quad m\,\frac{3-3}{3-3}=28.$$

The two large permanent tusks are preceded by two small deciduous ones, and the number of molar teeth which follow one another on each side of both jaws is certainly not less than six, of which the last three answer to the last three in the mastodon, and to the true molars of other diphyodont placental mammals.

I have shown in my "Odontography" that "The deciduous tusk makes its appearance beyond the gum between the fifth and seventh months: it rarely exceeds two inches in length, and is about a third of an inch in diameter, where it protrudes from the socket: the fang is solidified, and contracts to its termination, which is commonly a little bent, and is considerably absorbed by the time the tooth is shed, which takes place between the first and second years. The socket of



the permanent tusk in a new-born elephant is a round cell, about three inches in diameter, situated on the inner and posterior side of the aperture of the temporary socket." The permanent tusks cut the gum when about an inch in length, a month or two usually after the milk-tusks are shed. At this period, according to Mr. Corse,* the permanent tusks are "black and ragged at the ends; when they become longer, and project beyond the lip, they soon are worn smooth by the motion and friction of the trunk."

Their widely open base is fixed upon a conical pulp, which, with the capsule surrounding the base of the tusk and the socket, continues to increase in size and depth, obliterating all vestiges of that of the deciduous tusk, and finally extending its base close to the nasal aperture. The ivory of the tusk is formed by successive calcification of layers of the pulp, in contact with the inner surface of the pulp cavity; and, being subject to no habitual attrition from an opposed tooth, but being worn only by the occasional uses to which it is applied, it arrives at an extraordinary length, following the curve originally impressed upon it by the form of the socket, and gradually widening from the projecting apex to that part which was formed when the matrix and the socket had reached their full size.

These incisive teeth of the elephant not only surpass other teeth in size, as belonging to a quadruped so enormous, but they are the largest of all teeth in proportion to the size of the body; representing in a natural state those monstrous incisors of the rodents which are the result of accidental suppression of the wearing force of the opposite teeth.

The tusks of the elephant, like those of the mastodon, consist chiefly of that modification of dentine which is called "ivory," and which shows, on transverse fractures or sections, striæ proceeding in the arc of a circle from the centre to the circumference in opposite directions, and forming by their decussations curvilinear lozenges. This character is peculiar to the tusks of the proboscidian pachyderms, and is characteristic of true ivory.

In the Indian elephant there is a well-marked sexual difference in the growth of the tusks; they are always short and straight in the female, and less deeply implanted than in the male, she thus retaining, as usual, more of the characters of the immature state. In the male they have been known to acquire a length of nine feet, with a basal diameter of eight inches, and to weigh 150 lbs.; but these dimensions are rare in the Asiatic species.

Mr. Corse, speaking of the variety of Indian elephant called "Dauntelah," from its large tusks, which project almost horizontally, with a slight curve upwards and outwards, says, "The largest I have known in Bengal did not exceed seventy-two pounds avoirdupois; at Tiperah they seldom exceed fifty pounds." There are varieties of the Dauntelah in which the large tusks of the male are nearly or quite straight, and in a more marked breed, called "Mooknah," the tusks are much smaller, are straight, and point directly downwards. These ascertained varieties in an existing species ought to weigh with the observers of analogous varieties in the teeth of fossil proboscidians before they pronounce definitely on their value as characters of distinct species. More anomalous varieties occasionally present themselves in the Indian elephant, as, when one tusk is horizontal and the other vertical, or when, from some distortion of the alveolus, a spiral direction is imposed upon the growth of the tusk, as in that specimen figured by Grew in the "Rarities of Gresham College," and which is now in the Museum of the Royal College of Surgeons, London. The tusk of the elephant is slightly moveable in its socket, and readily receives a new direction of growth from habitual pressure. This often causes distorted tusks in captive elephants, and Cuvier relates the mode in which advantage was taken of the same impressibility in order to rectify the growth of such tusks in an elephant kept at the Garden of Plants in Paris.

The tusks of the extinct *Elephas primigenius*, or mammoth, have a bolder and more extensive curvature than those of the *Elephas indicus*. Some have been found which describe a circle, but the curve being oblique they thus clear the head, and point outwards, downwards, and backwards. The numerous fossil tusks of the mammoth which have been discovered and recorded may be ranged under two averages of size—the larger ones at nine feet and a-half, the smaller at five feet and a-half in length. I have elsewhere[*] assigned reasons for the probability of the latter belonging to the female mammoth, which must accordingly have differed from the existing elephant of India, and have more resembled that of Africa in the development of her tusks; yet manifesting an intermediate character by their smaller size. Of the tusks which are referable to the male mammoth one from the newer tertiary deposits in Essex measured nine feet ten inches along the outer curve, and two feet five inches in circumference at its thickest part; another, from Eschscholtz Bay, was nine feet two inches in length, and two feet one and a-half inches in circumference, and weighed one hundred and sixty pounds. I have also measured a specimen, dug up off Dungeness, which measured eleven feet in length. In several of the instances of mammoths' tusks from British strata the ivory has been so little altered as to be fit for the purposes of manufacture; and the tusks of the mammoth, which are still better preserved in the frozen drift of Siberia, have long been collected as articles of commerce.

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* See Mr. Corse's Memoir on the Teeth of the Elephant, in "Philosophical Transactions," 1799, p. 211. A good figure of the deciduous tusk is given in Plate 5.

In a specimen of the extinct Indian elephant (*Elephas ganesa*, F. and C.), preserved in the British Museum, the tusks are ten feet six inches in length, and in consequence of their small amount of curvature, they project eight feet five inches in front of the head; their apparent disproportion to the size of the skull is truly extraordinary, and exemplifies the maximisation of dental development.

In the account of the mammoth bones and teeth of Siberia, published in the "Philosophical Transactions" for 1737 (No. 446), tusks are cited which weighed two hundred pounds each, and "are used as ivory to make combs, boxes, and such other things; being a little more brittle, and easily turning yellow by weather and heat." From that time to the present, there has been little intermission in the supply of ivory furnished by the tusks of the extinct elephant of a former world. Cuvier[†] states, that the elephant of Africa, at least in certain localities, has large tusks in both sexes, and that the female of this species, which lived seventeen years in the menagerie of Louis XIV., had larger tusks than those in any Indian elephant, male or female, of the same size which he had seen.

The ivory of the tusks of the African elephant is most esteemed by the manufacturer for its density and whiteness. It has a semi-transparent aspect when recently fractured.

The molar teeth of the elephant are remarkable for their great size, even in relation to the bulk of the animal, and for the extreme complexity of their structure. I cannot omit, therefore, some notice of those teeth in the present discourse. The crown, of which a great proportion is buried in the socket, and very little more than the grinding surface appears above the gum, is deeply divided into a number of transverse perpendicular plates, consisting each of a body of dentine coated by a layer of enamel and this, again, by the less dense bone-like substance which fills the interspace of the enamelled plates, and here more especially merits the name of "cement," since it binds together the several divisions of the crown before they are fully formed and united by the confluence of their bases into a common body of dentine.

As the growth of each plate begins at the summit, they remain detached, and like so many separate teeth, or denticules, until their base is completed, when it becomes blended with the bases of contiguous plates to form the common body of the crown of the complex tooth from which the roots are next developed. The plates of the molar teeth of the Siberian mammoth (*elephas primigenius*), are thinner in proportion to their breadth, and are generally a little expanded at the middle; and they are more numerous in proportion to the size of the crown than in the existing species of Asiatic elephant.

In the African elephant, on the other hand, the lamellar divisions of the crown are fewer and thicker, and they expand more uniformly from the margin to the centre, yielding a lozenge-form when cut or worn transversely, as in mastication.

The horizontal as well as vertical course of development of the elephant's grinder is well illustrated by the molar, the last of the lower jaw. The separate digital processes of the posterior plates are still distinct, and adhere only by the remaining cement; a little in advance they are united, to form the transverse plate; and, at the opposite extremity of the tooth, the common base of dentine is exposed by which the plates are finally blended into one individual complex grinder;[*] this never takes place simultaneously along the whole extent of the tooth in the Indian elephant. The African species manifests a closer affinity to the *mastodon* by the basal confluence of the plates before the anterior ones are worn out.

The formation of each grinder begins with the summits of the anterior plate, and the rest are completed in succession. The tooth is gradually advanced in position as its growth proceeds; and in the existing Indian elephant, the anterior plates are brought into use before the posterior ones are formed.

When the complex molar cuts the gum, the cement is first rubbed off the digital summits; then their enamel cap is worn away, and the central dentine comes into play with a prominent enamel ring. The digital processes are next ground down to their common united base, and a transverse tract of dentine, with its wavy border of enamel, is exposed. Finally, the transverse plates themselves are abraded to their common base of dentine, and a smooth and polished tract of that substance is produced. From this basis the roots of the molar are developed, and increase in length to keep the worn crown on the grinding level, until the reproductive force is exhausted.

When the whole extent of a grinder has successively come into play, its last part is reduced to a long fang, supporting a smooth and polished field of dentine, with, perhaps, a few remnants of the bottom of the enamel folds at its hinder part.

When the complete molar has been thus worn down to an uniform surface, it becomes useless as an instrument for grinding the coarse vegetable substances on which the elephant subsists. It is attacked by the absorbent action, and the wasted portion of the molar is finally shed. The grinding teeth of the elephant progressively increase in size and in the number of lamellar divisions from the first to the last.

There are few examples of organs that manifest a more striking adaptation of a highly complex and beautiful structure to the exigences of the animal endowed with it, than the grinding teeth of the elephant. We perceive, for example, that the jaw is not encumbered with the whole weight of the massive tooth at once, but that it is formed by degrees as it is required; the division of the crown into a number of successive plates, and the subdivision of these into cylindrical processes, presenting the conditions most favourable to progressive formation. But a more important advantage is gained by this subdivision of the tooth; each part is formed like a perfect simple tooth, having a body of dentine, a coat of enamel, and an outer investment of cement; a single digital process may be compared to the simple canine of a carnivore; a transverse row of these, therefore, when the work of mastication has commenced, presents, by virtue of the different densities of their constituent substances, a series of cylindrical ridges of enamel, with as many depressions of dentine, and deeper external valleys of cement; the more advanced and more abraded part of the crown is traversed by the transverse ridges of the enamel inclosing the depressed surface of the dentine, and separated by the deeper channels of the cement; the fore part of the tooth exhibits its least efficient condition for mastication, the inequalities of the grinding surface being reduced in proportion as the enamel and cement which invested the dentinal plate have been worn away; this part of the tooth is, however, fitted for the first coarse crushing of the branches of a tree; the transverse enamel ridges of the succeeding part of the tooth divide it into smaller fragments, and the posterior islands and tubercules of enamel pound it to the pulp fit for deglutition. The structure and progressive development of the tooth not only give the elephant's grinder the advantage of the uneven surface which adapts the millstone for its office, but at the same time secure the constant presence of the most efficient arrangement for the finer comminution of the food, at the part of the mouth which is nearest the fauces.

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[*] "History of British Fossil Mammals," Vol. viii., p. 247.

[†] Loc. cit., p. 55.

[*] Some anatomists have described the divisions of the crown of the elephant's grinder as so many "distinct teeth," and Mr. Corse (Loc. cit., p. 213), who first propounded this view, calls each complex grinder "a case of teeth," and states "that these teeth are merely joined to each other by an intermediate softer substance acting like cement." But this statement applies only to the incompletely-formed tooth; and the detached eminences of each individual plate or of the crown of any complete tooth, at that stage of growth when they are held together only by the still uncalcified supporting matrix, might reasonably be regarded as so many distinct teeth.

With regard to the *microscopic structure* of the peculiar modification of dentine called "ivory," this is characterised partly by the minute size of the tubes, which, at their origin from the pulp cavity, do not exceed $\frac{1}{15000}$th of an inch in diameter, in their close arrangement at intervals scarcely exceeding the breadth of a single tube, and above all, in their strong and almost angular gyrations, which are much greater than the secondary curvatures of the tubes of ordinary dentine.

The dentinal tubes of ivory, as they radiate from the pulp cavity, incline obliquely towards the pointed end of the tusk, and describe two slight primary curves, the first convex towards that end, the second and shorter one concave; these curves, in narrow sections from near the open base of the tusk, are almost obscured by the strong angular parallel secondary gyrations. The tubes divide dichotomously, at acute angles, and gradually decrease in size as they approach the periphery of the tusk.

The characteristic appearance of decussating curved striæ, with oblique rhomboidal spaces, so conspicuous on transverse sections or fractures of ivory, is due to the refraction of light caused by the parallel secondary gyrations of the tubes above described. The strong contour lines observed in longitudinal sections of ivory, parallel with the cone of the pulp-cavity, and which are smaller, circular, and concentric when viewed in transverse slices of the tusk, are commonly caused by strata of minute opaque cellules, which are unusually numerous in the interspaces of the tubes throughout the substance of the ivory, and are in very great abundance and of larger size in the peripheral layers of cement. The close-set lateral branches of the dentinal tubes unite with the tubuli of the cells. The decomposition of the fossil tusk into the superimposed conical layers takes place along the strata of the opaque cellules, and directly across the centre of the gyrating dentinal tubes.

By the minuteness and close arrangement of the tubes, and especially by their strongly undulating secondary curves, a tougher and more elastic tissue is produced than results from their disposition in ordinary dentine; and the modification which distinguishes "ivory," is doubtless essential to the due degree of coherence of so large a mass as the elephant's tusk, projecting so far from the supporting socket, and to be frequently applied in dealing hard blows and thrusts. The central part of the tusk, especially near the base of such as have reached their full size, is occupied by a slender cylindrical tract of modified ivory, perforated by a few vascular canals, which is continued to the apex of the tusk. It is not uncommon to find processes of osteo-dentine, or imperfect bone-like ivory, projecting in a stalactitic form,* into the interior of the pulp cavity. The musket-balls and other foreign bodies which are occasionally found in ivory, are immediately surrounded by osteo-dentine in greater or less quantity.† It has often been a matter of wonder how such bodies should become completely imbedded in the substance of the tusk, sometimes without any visible aperture, or how leaden bullets may have become lodged in the solid centre of a very large tusk, without having been flattened. The explanation is as follows: A musket ball aimed at the head of an elephant may penetrate the thin bony socket, and the thinner ivory parietes of the wide conical pulp-cavity occupying the inserted base of the tusk, as represented in the figure. The hole is soon healed and filled up, by ossification of the periosteum of the socket, and of the pulp next the thin wall of ivory which has been perforated. The ball sinks below the level of this cicatrix, and the presence of the foreign body exciting inflammation of the pulp, an irregular course of calcification ensues, which results in the deposition around the ball of a certain thickness of osteo-dentine. The pulp, then resuming its healthy character and functions, coats the surface of the osteo-dentine inclosing the ball, together with the rest of the conical cavity into which that mass projects, with layers of normal ivory.

By the continued progress of growth, the ball so enclosed is carried forwards, in the course indicated by the arrow in the figure, to the middle of the solidified part of the tusk. Should the ball have penetrated the base of the tusk of a young elephant, it may be carried forwards by the uninterrupted growth and wear of the tusk, until that base has become the apex, and be finally exposed and discharged by the continual abrasion to which the apex of the tusk is subjected. Yet none of these phenomena prove the absolute non-vascularity of the tusk, but only the low degree of its vascularity. Blood circulates slowly, no doubt, through the prolongations of the pulp in the minute vascular canals which are continued through the centre of the ivory to the very apex of the tooth. And it is from this source that the fine tubular structure of the ivory obtains the correspondingly minute villi carrying the plasmatic colourless fluid by which its low vitality is maintained.

Development.—The matrix of the tusk consists of a large conical pulp, which is renewed quicker than it is converted, and thus is not only preserved, but grows, up to a certain period of the animal's life. It is lodged in the cavity at the base of the tusk; this base is surrounded by the remains of the capsule—a soft vascular membrane of moderate thickness—which is confluent with the border of the base of the pulp, where it receives its principal vessels.

I had the tusk and pulp of the great elephant at the Zoological-gardens longitudinally divided, soon after the death of that animal in 1847. Although the pulp could be easily detached from the inner surface of the pulp-cavity, it was not without a certain resistance, and when the edges of the co-adapted pulp and tooth were examined by a strong lens, the filamentary processes from the outer surface of the pulp could be seen stretching as they were withdrawn from the dentinal tubes before they broke. They are so minute that, to the naked eye, the detached surface of the pulp seems to be entire, and Cuvier was thus deceived in concluding that there was no organic connection between the pulp and the ivory. I regarded as equally valuable this rare opportunity of testing and confirming, by an examination of the recent animal, the account of the processes of conversion of those organs into the dental tissues, which I had previously given in my "Odontography."[*]

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* Haller seems to have been the first to notice these irregular internal deposits in the pulp-cavity of the elephant's tusk.—*Elementa Physiologiæ*, tom. viii., p. 519.

† Cuvier, *Annales du Museum*, tom. viii., p. 115 (1806). Goodsir, Edin. Philos. Trans., 1841, p. 97.

Having occupied so much time with that which is the main subject chosen for this evening's discourse, I must compress the few remaining observations upon the other tusks that are of commercial value, into the smallest compass.

With regard to the hippopotamus, the teeth, which are most valuable, are those called "canines" in comparative anatomy, but which, from their property of uninterrupted growth, are here called canine tusks. They are curved, consist chiefly of an extremely dense, compact kind of dentine, but are partially defended on their outside by a thick layer of enamel—so hard as to strike fire with steel. The partial application of this enamel is such as to cause the opposing ends of the upper and lower tusks to wear away obliquely, the enamel acting in this respect, like the harder layer of steel upon the chisel. The incisor teeth of the hippopotamus are also tusks, by virtue of their uninterrupted growth. They are curved in the upper jaw, straight in the lower jaw, but are smaller than the canine tusks, of less value, and are seldom imported.

In the walrus the tusks are limited to a single pair, growing from the upper jaw, and descending outside the lower jaw. Their substance is less dense and coarser than the dentine of the hippopotamus tusk, and is of proportionately less value in commerce.

The tusks of the narwhal are reduced to a single tooth in the same animal; and this, moreover, is restricted to the male sex. It grows from the upper jaw, in a straight line, parallel with the long axis of the body. It is, however, one of a pair, viz., the left one, the right tusk being abortive, but always to be found in a rudimentary state buried in the substance of the right maxillary bone. It is a very remarkable fact, that in the female there are originally a pair of these matrices or pulps, which form small rudimental tusks, that likewise remain concealed in the substance of the upper jaw, and are only detected by dissection. In the male the functional tusk, which would seem to be given to that sex as a weapon of combat or for defence, continues to grow until it acquires the length of 9 or 10 feet, with a basal diameter of 4 inches. This is that famous "horn" which figures on the forehead of the heraldic unicorn, and so long excited the curiosity and conjectures of the older naturalists, until Olaus Wormius made an end of the speculative and fabulous "monocerologies" by the discovery of the true nature of their subject, whilst Anderson,[†] in the year 1736, took advantage of the accident of the stranding of a narwhal at the mouth of the Elbe, to communicate to the zoological world an accurate figure of the animal, which bore the supposed single horn. Linnæus has embalmed the old idea of this weapon in the binomial *Monodon monoceros*, under which the narwhal is entered in the "Systema Naturæ." The exterior of the long tusk is marked by spiral ridges, which wind from within forwards, upwards, and to the left. About fourteen inches is implanted in the socket; it tapers gradually from the base to the apex. The pulp cavity, as shown in the longitudinal section of the tusk, is continued nearly to the extreme point, but is of variable width. At the base it forms a short and wide cone; it is then continued forwards, as a narrow canal, along the centre of the implanted part of the tooth, beyond which the cavity again expands to a width equalling half the diameter of the tooth, and finally, but gradually, contracts to a linear fissure near the apex.

Thus the most solid and weighty part of the tooth is that which is implanted in the jaw, and nearest the centre of support, whilst the long projecting part is kept as light as is compatible with the use of the tusk as a weapon of attack and defence. The portion of pulp in which the process of the calcification has been arrested, receives its vessels and nerves by the fissure continued from the basal expansion of the pulp cavity.

In a few instances both tusks have been seen to project from the jaw.

In the cranium of such a narwhal, figured by Alvers, the right tusk projects only six inches from the socket, is proportionately slender, and is smooth.

With regard to the conjectured ulterior use of the concealed tusk, in the male, as a substitute in the event of the loss of the large tusk *b*, a conjecture more than once repeated by writers, since first proposed by Reisel, the solidity of the concealed tusk and its distorted and generally closed base, evince that the term of its growth has expired. The substance of the narwhal's tusk is comparatively coarse, and of little value.

In conclusion I must express my acknowledgments to Mr. Robert T. Fauntleroy, for the opportunity he has kindly afforded me of examining the very extensive and instructive series of the tusks of the elephants of Africa, India, Siam, and Ceylon, accumulated in the extensive warehouses of the firm. There, also, I had the opportunity of comparing large collections of the tusks of the hippopotamus, and specially those of the walrus and narwhal. In this collection Mr. Fauntleroy obligingly pointed out to me some singular instances of malformation—spiral tusks, for example, of the African elephant, and a lower canine tusk of the hippopotamus, which, from some accident to the opposing tusk, had proceeded in its growth until it described an entire circle. I have also to express my acknowledgments to Mr. Fauntleroy for very instructive remarks on the modifications of the ivory of tusks of elephants from different localities—localities which influence their applicability to the arts, and consequently their commercial value.

DISCUSSION.

Colonel Sykes inquired whether the Professor could account for the singular spiral curve in the horn of the narwhal.

Professor Owen said it was according to the form of the socket. The spiral curve always ran in the same direction. He had seen only one instance in which the right tusk of the narwhal had grown out, and in that case the spiral curve was in the opposite direction. The impressions on the surface, and the curves of a tooth, were due to modifications of the cavity in which it grew.

The Chairman said he had the pleasure to announce that they were honoured this evening by the presence of Dr. Livingston, and he was sure the meeting would be delighted to hear from him the result of his lengthened experience in countries where this valuable article of commerce abounded.

Dr. Livingston said he had attended that evening for instruction, and he was afraid that he could add very little indeed to what had already been said with regard to the tusks of elephants. He had, however, seen the animal alive in great numbers in its native wilds, and he might mention a fact which, perhaps, had not come under the observation of the learned Professor, viz., that by the Africans the elephant was regarded as one of the best tests of the courage of the hunter. If a man was able to kill an elephant, it was considered by the African that he could achieve almost anything in the way of hunting. It was not considered fair sport to hunt the elephant with dogs, as in such cases undue advantage was taken of the animal, owing to his attention being so much occupied by the harrassing of the dogs, that he would pay no attention to his more formidable assailant—the hunter. Sometimes he would kneel down, in an awkward endeavour to crush the dogs with his knees; at other times he would take hold of a large tree (perhaps twelve inches in diameter) and push it down in order to crush the dogs. The hunters in Ceylon, for the most part, approached within a short distance of the elephants, and killed them in the manner described by Professor Owen. In Africa the hunters generally approached to the side of the elephant within about thirty yards, and at that distance the animal was killed, on an average with about half-a-dozen balls; from a greater distance it might take 50 balls to despatch him. When residing at Kolobeng he took the trouble to put down the number of elephants that were annually killed in the country beyond. He found there hunters from England and from India—officers on furlough; there were also Boers, who considered themselves the bravest people on the face of the earth,—and native hunters and bastard Boers. The Boers and natives were exceedingly anxious to get hold of the ivory, owing to its high price. In observing the operations of these several classes of hunters and their results, he found that civilisation did not necessarily cause effeminacy: that, taking the four classes of hunters—the English officers, the Boers, the bastard Boers, or Griquas, and the natives—the number of elephants killed by the first-named was about 20, by the Boers about 2, and by the bastard Boers and natives about a half. From this fact he repeated that it would seem that civilisation did not necessarily produce effeminacy. The reason why the English hunters killed more animals than the others was because they had the courage to go closer to the elephant before they fired, whilst the others made the attack at a greater distance, and if they happened to bring down an elephant it was an event of their lives. The number of elephants in existence at the present day on the vast continent of Africa had been stated, by the celebrated hunter, Mr. Gordon Cumming, to be very large. Such was the fact; but in going northwards he found the number increased wonderfully. On the Zambesi he found an immense number of elephants, which, however, were not of so large growth as the animals in the south. He had expected, as he went further north, with rich and abundant forest vegetation, the animals would have been found much larger; but whilst the elephants of Limpopo were nearly 12 feet in length, those on the Zambesi were three feet less. The tusks, however, of the latter were much larger than those of the animals located in the southern regions. He had often attempted to account for the fact that the tusks of the smaller animal were so much larger than those belonging to the more bulky animal of the south, but he had only learned the explanation this evening from Professor Owen. The Professor had very reasonably remarked that, in those regions where the elephant had remained undisturbed by man, and passed a quiet existence, the tusks grew more regularly than in those parts where the animals were harassed, as was the case in the south, where fire-arms were in use. The elephants to the north of the Zambesi were so numerous that he could hardly imagine their ever becoming extinct. Difference of opinion prevailed with regard to the term of life of the elephant. Some persons fixed it as high as 200 years, which, he believed, had been based upon data obtained from India. Sometimes, in Africa, they saw a great number of young elephants of different sizes following the same dam, small calves, like the one now in the gardens of the Zoological Society, with others about half-grown. It would appear that the estimates of the age of the elephant, according to the data received from India, had been placed too high, but that question they might, perhaps, have an opportunity of settling by the calf now in London.

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[*] Pp. 643—655.

[†] Cited by Cuvier, Ossem. Foss. v. pl. 1, p. 319.

Mr. Davenport said he had listened with much pleasure and interest to the remarks of the learned lecturer with reference to the tusks of the walrus, but there might be dentists in the room to whom some further information with regard to the dentition of the walrus would be very valuable.

Professor Owen said—the subject of the paper being the teeth of commerce, and the tusks of the walrus being the least valuable, the time also being limited, he had said least upon that subject. With regard to the matters on which the last speaker had asked for information, he would refer him to a paper recorded in the proceedings of the Zoological Society of last year, in which there was as much information upon the law of dentition in the walrus, as could be obtained from observations made on a young walrus then existing in the gardens of the Society. In addition to that, the osteological collection of the Royal College of Surgeons of London furnished, perhaps, the best series of specimens extant of dental development in the walrus, derived from the various arctic expeditions, and the stages of dentition were recorded in the published Osteological Catalogue.

The Chairman then proposed a vote of thanks to Professor Owen for the very clear and lucid information he had given upon this interesting subject—information which he ventured to say the veriest tyro in zoological science might understand, and the most learned might profit by.

The thanks of the meeting were then passed to Professor Owen.

The thanks of the Society are due to Messrs. Fauntleroy, for the loan of an extensive collection of tusks and teeth; to Mr. Tomes, Messrs. Ashe, Messrs. Smale, and Mr. Hambleton, for interesting and valuable specimens contributed by them; and to Miss Holtzapffell, for specimens of ivory and teeth, and of turned ivory.

In the Reading-room were exhibited specimens of wood-carving, by Mr. Perry; a model showing a means of converting a reciprocating into a rotary motion without the use of the crank, by Mr. Hitts; and a new chemical balance by Mr. J. Castle.

The Secretary announced that the next Ordinary Meeting of the Society would take place on the 14th of January, when a paper "On the Natural Resources of Honduras," by the Hon. R. Temple, Chief Justice, would be read.

The Secretary has received the following letters since the meeting:—

"Sir,—In illustration of the valuable paper furnished by Professor Owen, I can add the official statistics of the trade for some years past, and a few notes which may, perhaps, come in by way of elucidation of the subject. My brother-in-law, Mr. R. B. Walker, who has only returned a few days ago from the West Coast of Africa, where he has been engaged with his brothers in trade for several years past, has given me access to his notes and documents, by which I have been able to glean some data as to prices and supply, which may be useful.

"Of late years the supply has been rather increasing than decreasing.

"In 1827 we imported upwards of 3,000 cwt.; in 1842, 5,000 cwt.; in 1850, 8,000 cwt.; nearly all of which was taken for home consumption; and the average import of the last three years has been 9,354 cwt. Whether the supply will keep up, is a question for future determination, for certainly such hunters as the late Major Rogers, of Ceylon, who killed his 2,000 elephants, and Mr. Gordon Cumming, are fast thinning out the race of those animals.

"The African elephant yields the largest tusks. Mr. Gordon Cumming has one weighing 173lbs. Mr. Cawood, of Graham's Town, had a pair in his possession, weighing 330lbs. A tusk was recently shipped from Camaroon to Liverpool, weighing about 164lbs.; and, two or three years since, one to Bristol, weighing about 147lbs.

"The teeth proper of the elephant are worthless, and on the West Coast of Africa are never purchased.

"At the Great Exhibition in 1851 some tusks of the African elephant were shown, which weighed 162 lbs.

each, measured 8 feet 6 inches in length, and 22 inches in basal circumference.

"It is a singular fact that the domestication of the elephant is usually attended by deterioration of the length and quality of the ivory.

"The total imports of ivory in the past three years have been as follows, showing a gradual decline. The imports from the East Indies and Africa were proportionately as follows, in cwts.:—

	Africa.	Mediterranean.	East Indies.	Total.
1853	4,882	1,238	3,330	10,388
1854	3,462	1,048	3,642	9,299
1855	3,974	871	2,748	8,376

"The imports from India and the East, according to a parliamentary paper, have averaged about 3,341½ cwt. in the last seven years, namely:—

	Cwt.		Cwt.
1849	4,058	1853	3,123
1850	3,444	1854	3,166
1851	2,580	1855	2,599
1852	4,425		

"The estimated value of this ivory in 1854 was £80,733, and in 1855, £68,874. From Ceylon the quantity exported has not averaged during the last five years £200 in value. The quality of the African ivory varies considerably. That best adapted for the English market comes from the Camaroon coast, and the most esteemed runs from 50 lbs. weight upwards, the next in value 35 lbs. to 50 lbs., then from 18 lbs. to 35 lbs. All below 18 lbs. are called scrivelloes, and are of the least value, except such as are adapted to cutting billiard balls, which, in proportion to their size and cost, are the most valuable of all. Tusks are valuable in proportion to their size; those that weigh 1 cwt. or more, are the most valuable, and fetch from £40 to £50 the cwt.; the second class comprehends such as require two teeth to make a cwt. or more; the third class, three or more to the cwt.

"The highest price I have ever known ivory to bring was £55 per cwt., which has just been given. Some sold at Liverpool last year fetched £50, part of which was shipped by Mr. Walker, having boen purchased by him in the neighbourhood of Camaroons, Gaboon, &c. 'This price,' he adds, 'I am assured by my owners, was never attained before, during the period they have been in the trade, though since then it has risen still higher, and I confidently expect that what I have now on the way home will realise *even more.*'

"The sea-horse teeth (so called) are the tusks of the hippopotamus.

Liberia, since it was first colonised by the American free negroes, has not, I am nearly certain, exported such a quantity of ivory as is usually asserted, though possibly at the present time it might reach 20,000 to 25,000 dols. annually, that is to say, the produce of the territories of the republic and the country immediately behind it.

"Gaboon, Loango, Congo, and Ambriz, are next to the Camaroons in quality, but much greater in quantity; Gaboon and its immediate neighbourhood, being that part of the coast which is made their head quarters by the Liverpool and Bristol traders, export an enormous quantity of ivory annually, I should say to all parts, but principally to England, France, and the United States of America—not less than 80 tons. My brother Henry, between the months of May, 1851, and November, 1852, both inclusive, shipped more than 26 tons, and there were many other traders purchasing at the same time. I, myself, have, during my stay of about 20 months, at least six of which I was without goods, purchased and shipped about 14 tons. At present ivory on this part of the coast is much dearer than it was formerly, in 1851 and 1852; in fact, the price has doubled, and in some instances more than doubled, although the Bristol traders do not frequent the Gaboon, &c., so much. The French merchants are the principal cause of this enormous advance in price, though an allowance must of course be made for the dearness of many articles of our trade, caused by the late war, as powder, guns, rum, &c.

"My last shipment of nearly 9½ tons averages about 16½lbs., and that is a large one, as I purchased but few scrivelloes. In fact, I think, for West African ivory, 15lbs. would be a very fair average.

Ivory shipped per "Coquette," 1856.

	Weighing. lbs.	Average. lbs.
1,276 elephants' tusks	20,953	16½
75 sea-horse (hippopotamus) teeth	78	1

Ivory Shipped per "Coquette," 1855.

	Weighing. lbs.	Average. lbs.
556 elephants' tusks	9,698	17⅖
15 sea-horse teeth	17	1

"This makes the average for elephants' teeth a little over 17lbs.

"The Gold Coast ivory, and that brought down for shipment to Sierra Leone and Cape Coast Castle, ranks next, and is tolerably good. The tusks from Gambia are usually very bad, always broken, very crooked, cracked in the hollows, and more or less damaged.

"Fine ivory is known by having no cracks or flaws, either in the solid or in the hollow. Cracks in the ivory are a serious detriment, and must be always particularly noticed. The elephant's tusks that are only rather tapering in shape are most liked; very crooked teeth must be guarded against, as they cut up to great disadvantage. Broken-pointed tusks, or those with deep flaws, or otherwise damaged about the point, must be avoided. Teeth with large hollows are not at all liked, as there must inevitably be a great waste in cutting them up; in short, a fine tusk is known by being of a neat tapering shape, having a small hollow, free from cracks, with a fine, thin, clear coat, free from flaws; it is also transparent, which may be discovered by holding the point to the candle.

"The Gold Coast ivory may generally be known by having a rough hewn hole made near the end of the hollow, and is much esteemed."

I am, &c.,
P. L. SIMMONDS.

"Sir,—Allow me to offer a few remarks in connection with the subject so ably brought before the Society of Arts on Wednesday evening last by Professor Owen.

"In his admirable paper upon "The Ivory and Teeth of Commerce," Professor Owen alluded to the use made of the teeth of certain animals in supplying the deficiencies in the same organs in the human species, arising from certain diseases from which few persons are absolutely exempt.

"Three kinds of teeth, viz., those of the hippopotamus, walrus, and whale, are employed by dentists in the construction of artificial teeth, mineral or natural (that is human) teeth being generally fixed into the former in the anterior portions of the mouth.

"The above organic substances are unfortunately acted upon by the fluids of the mouth, in some instances so rapidly that it is necessary to have them renewed every two or three years. This great drawback to their general application has led to the introduction of gold and platinum, bodies with difficulty oxidised, as bases upon which mineral teeth may be fixed

"There are, however, many cases in which dentine is preferable, if not absolutely necessary, and it is, therefore, of the greatest importance that search should be made for some substance which, possessing the properties of dentine, shall not be decomposed by acid or alkaline bodies.

"Many such experiments have been instituted, and, as the result, a variety of substances have, from time to time, been submitted to the notice of dentists, all, however, falling short of the required conditions.

"I am far from considering the subject exhausted, and believe it would well repay the attention of any chemist who would make a series of experiments with the view of producing an artificial ivory, even if at a cost of 20s. or 40s. per lb.; a body capable of becoming soft at a temperature 300 Fahrenheit, or forming a hard hydrate with water, would be of greater value.

"That our necessities will one day demand such a substance, I believe, notwithstanding the remark of Dr. Livingston, that in Africa the supply of elephants appears almost inexhaustible, for it seems reasonable to suppose that, as civilisation advances, and the demand for dentine increases, seas, rivers, and plains will become exhausted of their ivory-producing inhabitants. As the coal-field has supplied the deficiencies of the forest, and as the pump will probably some day supply the deficiencies of the coal cellar, so doubtless artificial dentine will supply the place of natural, and a great benefactor will he be to the toothless community who first produces it.

"On other points in the learned professor's paper I will refrain from making any observations, only hoping the subject, and especially that portion of it which relates to the development of the dental tissues, will receive more general attention when the Odontological Society is in full operation.

"I am, &c.,
"A. COLEMAN.

"Spring-lodge, Wandsworth, Dec. 18, 1856."

SITE OF NEW NATIONAL GALLERY.

In the *Gazette* of Tuesday the 13th inst., it is notified that the Queen has been pleased to direct letters patent to be passed under the Great Seal, constituting and appointing the Right Hon. Lord Broughton; the very Rev. Henry Hart Milman, D.D.; Richard Ford, Esq.; Michael Faraday, Esq., D.C.L.; Charles Robert Cockerell, Esq.; and George Richmond, Esq., to be her Majesty's Commissioners to determine the site of the New National Gallery, and to report on the desirableness of combining with it the Fine Art and Archæological Collections of the British Museum, in accordance with the recommendation of the Select Committee on the National Gallery in 1853.

Home Correspondence.

SNAKES AND THE SUPPOSED REMEDIES FOR SNAKE-BITES.

Sir,—Apropos of the experiments recently made at the rooms of the Society of Arts, which I had the satisfaction of witnessing, but more especially in reference to the letters of Dr. Chambers and Judge Temple, on snake poison and its remedies—the whole subject is one alike of scientific and popular interest, and it is possible that I may be able to add a fact or two to the stock of information bearing upon it. In the first place, however, allow me to observe, that what are called the *tropics* are not so generally infested by troublesome insects and poisonous reptiles as is commonly supposed. The number of them, in fact, their very existence there, as well as everywhere else, depends upon a variety of circumstances. In some districts they are often numerous, troublesome, and dangerous, while in others they are almost wholly unknown. But everywhere they are, if not less numerous, certainly less dangerous than is generally supposed.

I have travelled pretty extensively in Central America in all directions, throughout the length and breadth of the States of Nicaragua, San Salvador, and Honduras, spending there upwards of two years and a-half, and have crossed and recrossed the continents eight times, from sea to sea, and followed the crests of the Cordilleras during a continuous period of upwards of thirty days. Yet I have suffered more, in a single week, from mosquitos in New York, and from fleas in Switzerland and Italy, than from either of these pests during my whole stay in Central America. In fact, during that period, with the exception of occasional annoyances from these insects, I found nothing to complain of on this score. I got a *nigua* (chigoe, or jigger) in my foot at San Juan de Nicaragua, and at Grenada was stung by a scorpion, which had ensconced itself in my boot, where it was exemplarily crushed. A little concentrated *aqua ammonia* rubbed over the puncture, and a trifle of strong brandy taken inwardly, prevented any perceptible consequences, beyond the original smart, which my negro servant "Ben" compared to that of being stung "by a whole hive of bees at once, and in the same spot!"

As regards snakes, I think I may affirm that, beyond a certain belt, bordering the Atlantic, and varying in width as the mountains approach the coast or recede from it, there is, perhaps, no country in the world (Ireland always excepted) so free from snakes as Central America, or at least those parts visited by me. In the vicinity of San Juan, which has a moist, hot climate, and where the country is almost covered with jungle, venomous serpents are numerous, and deaths from their bite not uncommon. The day of my arrival there, in May, 1849, was marked by a death from this cause. In ascending the river, I saw several serpents twining amongst the vines and broad-leaved plants, which lined the banks with a brilliant mosaic of leaves and flowers. Amongst them was the deadly *corral*, looking like a necklace of alternating coral and jet. In the interior, on the comparatively low and relatively wooded plains of Nicaragua, I saw one or two *corrals*, as many rattlesnakes (*cascabellas*), and several harmless boas, one of which Ben carefully *sacked*, and brought home with him as a pet.

During the year and a-half that I resided at Nicaragua, I was much engaged in exploring unfrequented places for ruins, and in investigating the ancient monuments of the country—precisely where, it would be supposed, I should have encountered serpents. But, during all of these explorations, so far as I can now remember, I found but one—a rattlesnake—a splendid fellow, with fourteen rattles in his tail!

My last expedition, running over fourteen months, was chiefly spent, at the head of a large party, in making the explorations and surveys for the proposed Honduras inter-oceanic railway. Our explorations were carried on, not only from the Gulf of Fonseca, on the Pacific, to Puerto Caballos, on the Atlantic, but embraced two of the departments of Nicaragua, and all of those of Honduras and San Salvador. Yet, so far as I can learn, not more than half-a-dozen snakes were seen by my party during the entire period of our stay. I am able to speak with emphasis upon this point, from the circumstance that we had a naturalist attached to our expedition, well provided with what the members of the party irreverently called a "pickling apparatus," for preserving specimens of all kinds of "beast, and bird, and creeping thing," which we might encounter. This gentleman (Dr. S. W. Woodhouse), moreover, had a special interest in snakes, inasmuch as he had been bitten by a rattlesnake, while attached to the United States expedition for the survey of New Mexico and the valley of the Colorado river, under the command of Captain Sitgreaves, and had recovered, to give practical force to what we are told was predicted of the seed of the woman. One of the standing rules for the observance of my corps was, that all "varmints" should be religiously given over to the Doctor; and there was a general rivalry to see who should contribute most largely to his collection. Yet his crop of snakes barely numbered half a dozen, of which one (a *tamagasa*, called by the English negroes *Tommy Goff*) was contributed, I believe, by Judge Temple himself, at Belize.

One only, of the snakes found in Honduras (a *corral*) was poisonous. The others, as the Doctor explained to a disgusted auditory, as he picked them up with his hands, were "mere garter snakes, harmless as flies!"

I have elsewhere ("Notes on Central America," &c., p. 196,) accounted for the almost entire absence of serpents in the interior of Central America, and on the *plateaus* which make up so large a part of the country, as the consequence of "the common practice of burning the dry grass and withered vegetation during the dry season." It is undeniable, however, that serpents are quite common on the northern or Atlantic coasts of Central America. For the most part they are harmless, and are seen by the natives in their huts rather with pleasure than alarm or disgust, since they are useful in the destruction of vermin. The harmless snakes are, in general, long and slender in body, with round spots on the head, angular marks under the tail and belly, and covered with oval scales. One variety grows to a large size, and is only dreaded by the Indians, who call it *woulah*, because of its reprehensible appetite for fowls, in part set off, however, by a habit of destroying the smaller varieties of poisonous snakes. The latter are distinguished by a comparatively thick body, short tail, and a broad head, covered with scaly plates. For all these, universal report boldly testifies that the *guaca*, or what in Honduras is called *guaca*, is a reliable remedy. I had given to me what seems to be the kernel of a nut, resembling in size, shape, and general appearance the kernel of the filbert, the produce of a certain shrub which grows in Nicaragua, as a specific against the poison of snakes. It was presented to me by Dr. Juarros, of Leon de Nicaragua, who called it "*ojo de buey*," ox-eye. He also gave me written directions for its use, which I regret I have not by me at this moment, but as we had no opportunity of testing its virtues, I am unable to speak of its value.

I have mentioned that Dr. Woodhouse, the naturalist of my expedition, had himself been bitten by a rattlesnake. Being at the same time patient and practitioner, his account of his own case has a special interest, and a real scientific value; and, as I presume it has never been printed in England, I send it to you herewith, believing, that in connection with the subject now fairly up, it will be deemed worthy of attention.

I may here mention, that when in Leon, I went to visit a man who kept a "tame rattlesnake," quite loose, in his house, and was reported to be a snake charmer, or possessed of a specific against snake venom. He explained to me, however, after a little questioning, and in reply to my suggestion that he had extracted the teeth of the reptile, that he deprived it of its poison by irritating it at short intervals, and making it bite a staff of a soft porous wood, newly cut from the green tree. His hypothesis was, that the wood absorbed the poison—thus confirming the suggestion of Judge Temple, that the bite of a venomous serpent may be fatal at one time and harmless at another.

I am, &c.,
E. G. SQUIER.

EXTRACT REFERRED TO IN THE FOREGOING LETTER.

Academy of Natural Science,
Philadelphia, January 22, 1853.

Sir,—* * * * * On Wednesday morning, the 17th of September, 1851, while Lieut. Parke and I were walking out to procure some specimens of birds, when about two miles from Zuni, New Mexico, in passing along an Indian trail, I came within a few inches of treading upon a rattlesnake, which immediately coiled himself up and prepared to strike. Jumping back, I drew my ramrod, and with it struck him over the back, with sufficient force to break it. Being a fine specimen, I wished to preserve him without further injury, when, placing my gun on his neck, and seizing it, as I supposed, immediately at the back of the head, I picked him up; but, unfortunately, I had too long a hold, and he threw round his head and buried his fang in the side of the index finger of my left hand, about the middle of the first phalanx. The pain was intense, and momentarily produced a sickening sensation. I immediately commenced sucking the wound; at the same time I got Lieut. P. to apply a ligature round the finger, to prevent the too rapid absorption of the poison. Scarifying the finger freely, I continued sucking the wound until I returned to camp. I sent a man, who was with us at the time, immediately back to the pueblo, to bring me some *aqua ammonia fortis*. He met me about three-fourths of a mile from the pueblo. I immediately applied it freely to the wound, when I was met by Mr. Kern, who wished me to try the western remedy; that is to say, to get drunk. This remedy I had often heard of, and, determined to try its efficacy, I commenced drinking whiskey. By the time I reached the pueblo I had drank about half a pint. During all this time I continued sucking the wound; then taking some ammonia internally, I scarified the finger, holding it in a basin of warm water, which allowed it to bleed freely. Already the glands in the axilla were getting sore and painful. I commenced drinking brandy; at the same time holding my finger in a cup of ammonia. It took a quart of fourth-proof brandy, besides the whiskey, to produce intoxication, which only lasted some four or five hours. During this state I vomited freely. Soon after coming to my senses, I removed the ligature, and applied a large poultice of flaxseed-meal. I repeated the ammonia internally, and took some *mass hydrg.* and *ext. collocynth comp.* as a cathartic. In the evening the glands in the axilla were quite painful; so was also the finger; took *pulv. doveri*, grs. x.

Thursday, 18*th*.—Passed a restless night, without sleep, although having taken during the night *pulv. opii.* grs. iv. This morning the pain in the finger is intense; a well-marked line of inflammation extends along the arm to the axilla; had the entire arm and hand painted with tincture of iodine, and the poultice renewed; commenced taking *potassii iodidi* as an alterative. The pills not having operated, took *pulv. Seidlitz*, which had the desired effect. Diet, boiled rice. Several times, on my attempting to walk a few yards, I was seized immediately with nausea and vomiting. This continued for several days. Took at bed-time *pulv. doveri*, grs. x. The arm and hand I have resting on an inclined plane, which affords considerable relief.

Friday, 19*th*.—I rested pretty well last night; but this morning my arm, hand, and the glands in the axilla are much swollen and very painful. Repeated the tincture of iodine Diet, boiled farina. Took, on retiring, *pulv. doveri*, grs. x.

Saturday, 20*th*.—Passed a tolerable night, but my back is getting very sore, as the blankets on the stone floor make rather a hard bed. This morning the pain is very great, and the swelling extends down the left side to the hips; renewed the tincture of iodine; removed the skin from off the finger; it discharged freely a watery, sanguineous fluid, without smell; the nail is becoming loose. The broad red line following the course of the lymphatics is now filled with yellow serum. The point where the fang entered, for the space of three-eighths of an inch, is of a dark-brown colour. This evening at bed-time took *mass hydrg.*, grs. v; *pulv. doveri*, grs. x. Continued *potassii iodidi*. Diet the same.

Sunday, 21*st*.—Passed a restless night, the hand being filled with serum, and much trouble with cholic; took *magnesia calci* and *spts. mentha piperita*. My bowels not being opened, took *pulv. Seidlitz*, and was relieved.

Monday, 22*nd*.—Passed a comfortable night, the swelling having left my side and arm; but little remains in the hand. Continued *potassii iodidi*. Low diet. I can now walk a few yards without nausea, and am able to sit up for most of the day. Diet, mutton broth and farina.

Tuesday, 23*rd*.—I awoke this morning feeling much improved, the swelling and pain having left, with the exception of the finger, the first and second joints of which do not present a healthy appearance, the palmar surface having much the appearance of gangrene; but the discharge is thin and watery. I can detect no smell. The granulations do not present a healthy appearance; they are rough, and many of them look as if they were sprinkled with yellow ochre. The nail is quite loose. Continued *potassii iodidi*. Diet, mutton broth, with a little of the meat.

Wednesday, 24*th*.—This day we commenced our march; after going six miles, encamped. I placed my hand in a sling, and it was with the greatest difficulty I could manage the mule with one hand, being rather weak, and the animal rather obstinate. The sun was very hot; this, with the jolting, caused me to suffer considerable pain.

I removed the nail; from this time the finger gradually improved. Continued the poultice until the last of October, when I applied *cerate simplex*. In the mean time there was a large slough, which gradually came away and left the last phalanx exposed in two places. The granulations required occasionally the application of the nitrate of silver. Continued with my hand in a sling until about the middle of November.

A new nail commenced growing, and a small sinus remained in the end of the finger; upon the introduction of a probe into which, the bone could be felt quite rough. A discharge from this kept up until about the 7th of February, when I removed the exfoliation of the end of the last phalanx, showing evidently that the fang had entered the periosteum. Soon after this the sinus closed, leaving it in a deformed state, anchylosis having taken place in the first joint. The circulation is very imperfect, one of the arteries being destroyed, which renders it very susceptible to cold. The insertion of the flexor muscle is also destroyed.

I am, Sir, with much respect, your obedient servant,
S. W. WOODHOUSE, M.D.,
Surgeon and Naturalist to the Expedition.

Brevet Captain L. Sitgreaves,
U. S. Topographical Engineers, Washington.

UTILISING SEWAGE.

Sir,—With reference to Mr. Cooke's deeply interesting paper, will you permit me to reply to an oversight on Mr. Wright's part, who asks, "if the Leicester sewage bricks sell at 2s. a ton, can your lime be got at 2s. a ton," to which I reply, Mr. Cooke states that £16,250 worth of lime could precipitate £30,000 worth of manure, valuing at 2s. a ton, or £60,000 if valued at 4s., viz., at the price received for the article at Leicester.

With regard to the chemical objection that lime will not precipitate the ammonia—then I reply the ammonia remains in the water that is passed off, and if so, why should there not be a canal constructed through Essex, and another through Kent, to carry off this perfectly odourless water, to be utilised as it passes along, or, when not demanded, passed on to the German ocean if necessary. But when we remember that the meadows near Edinburgh, through which the sewage flows, let at £30 and £40 an acre per annum! it appears little less than madness to waste the enormous manuring wealth flowing from three million human beings.

I am, &c.,
GEO. WYLD, M.D.

PRECIPITATION OF SEWAGE FROM WATER.

Sir,—In the last number of the journal I observe, that Mr. Higgs contends with Mr. Wicksteed for the invention of the process of adding lime to water for the purpose of precipitating the "sewage" from it. Some of your members may not perhaps be aware that as far back as 1841, many experiments were made, and with perfect success, by Dr. Clark, of Aberdeen, upon the water of the Medlock, at Manchester, to precipitate *the sewage and filth from it, and to sweeten the water* before it entered the Duke of Bridgwater's Canal, and Dr. Clark urged its adoption on more than one occasion upon the canal authorities. He had established that it would require about *one ton of lime per day*.

I was myself aware of this many years back; but every one still having doubts about it, may, I think, have them removed by reading a correspondence which took place on the subject in the *Manchester Guardian* of 14th, 15th, 17th, and 18th of April last.—I am, &c.,
DUGALD CAMPBELL.

7, Quality-court, Chancery-lane, Dec. 16.

Proceedings of Institutions.

Coventry.—On Thursday evening, the 27th of November, a lecture, "On Zoology," was delivered in St. Mary's Hall, by Dr. Trevethan Spicer, before the members and supporters of the Institute. The lecturer took a broad view of the subject, so as to make it interesting to a mixed audience. The hall was well filled, and the clear and able manner in which each portion of the subject was treated rendered the lecture not only instructive, but highly gratifying to all present.—Miss Lizzy Stuart gave her Scottish entertainment entitled "A Peep at Scotland through her Songs," before the members of the Institute, on Thursday, the 4th inst., and gave great pleasure to a large audience.

Royston.—Two lectures which afforded unusual gratification to the members of the Institute, were recently delivered by George Grossmith. They were entitled "Pickings from Pickwick," and "Martin Chuzzlewit," and form part of a course on the writings of Charles Dickens.

To Correspondents.

Erratum.—At page 63, first column, line 18, for "secretary" read "architect."

MEETINGS FOR THE ENSUING WEEK.

Mon. London Institution, 7. Dr. Tyndall, "On the Nature and Phenomena of Light."
Wed. London Institution, 3. Professor Rymer Jones, "On Vivaria and their Inhabitants."
Sat. London Institution, 3. Mr. T. A. Malone, "On Experimental Physics, chiefly in Relation to Chemistry."
Royal Institution, 3. Professor Faraday, "On the Gravitating Force."

PATENT LAW AMENDMENT ACT.

APPLICATIONS FOR PATENTS AND PROTECTION ALLOWED.

[*From Gazette, December* 12*th*, 1856.]

Dated 30*th August*, 1856.

2018. François Long, Paris—Improvements in life-boats.

Dated 19*th September*, 1856.

2195. William John Bisseker, 13, Ludgate-hill, Birmingham—Improvements in strings or wires used in or on musical instruments.

Dated 24*th September*, 1856.

2238. Joseph Bennett Howell, Sheffield, and Nicholas Harvey, 12, Haymarket—Improvements in steam and other boilers.

Dated 27*th October*, 1856.

2520. James Fenton, Low Moor, near Bradford, Yorkshire—An improved method of and signal apparatus for preventing accidents on railways.

Dated 8*th November*, 1856.

2630. William Gossage, Widnes, Lancashire—Improvements in the manufacture of carbonates of zinc, of iron, and of manganese, and in the useful application of such carbonates.

Dated 21*st November*, 1856.

2754. Auguste Mathieu Maurice de Bergevin, Sermon-lane, City of London—A method or methods of purifying coal without decarbonisation.
2758. Charles Tooth, Burton-upon-Trent—Improvements in charging or filling and filling up casks or other vessels for containing fermenting liquids.
2760. Sigmund Rothenheim, London—An improved walking-stick pipe.
2764. Samuel Russell, Darnley-terrace, Gravesend—Improvements in the construction of scissors and shears.
2766. Charles Garton, and James St. John Gage Parsons, Bristol—A method of treating cane sugar, in order to fit it to be employed in brewing and distilling.

Dated 22*nd November*, 1856.

2770. George Bell Galloway, 42, Basinghall-street—Improvements in furnaces for steam boilers and other uses.
2774. Joseph Wheeler, Wootton-under-Edge, Gloucestershire—A method of converting rotary into reciprocating motion, especially applicable to machinery for forcing plastic substances through moulds and dies.
2776. John Skirrow Wright, Birmingham—Improvements in the manufacture of paper or papier maché and metal buttons.
2778. David Chadwick, Salford, and Herbert Frost, Manchester—Improvements in apparatus for measuring water and other fluids and gas.

Dated 24*th November*, 1856.

2780. Edmund Hunt, Glasgow—Improvements in looms for weaving ornamental fabrics.
2782. James Broadley, Saltaire, Yorkshire—Improvements in weaving.
2784. Masta Joscelin Cooke, 45, Dean-street, Newcastle-on-Tyne—Certain improvements in washing, wringing, and mangling machines.
2786. William Henry Aston and Samuel Hopkinson, Zetland Mills, Huddersfield—Improvements in steam-boiler furnaces and apparatus employed for supplying water to steam boilers.

2788. Charles Edwin Heinke, Great Portland-street—Improved apparatus for illuminating objects beneath the surface of water, or for giving light in mines and other places where combustible or explosive gases exist.

2790. George Sharp and William Elder, Jarrow, Durham—Improvements in steam hammers and machinery for forging iron and other substances.

Dated 25th November, 1856.

2792. Henry Bragg, jun., Belfast—Improvements in drying or extracting moisture from air, and in machinery or apparatus for starching, clearing, drying, stretching, and finishing fabrics.

2794. Richard Archibald Brooman, 166, Fleet-street—Improvements in machinery for embroidering. (A communication.)

2796. Jacob Levi Elkin, Jeffrey's-square, St. Mary Axe—An improved process applicable to the manufacture of zinc. (A communication.)

2797. John Marshall, jun., Selby, Yorkshire—An improvement in the purifying of oils and fatty matters.

2798. Alfred Vincent Newton, 66, Chancery-lane—Improved machinery for forging iron. (A communication.)

Dated 26th November, 1856.

2800. John Brown, Bolton-le-Moors, and John Adin, Manchester—Certain improvements in Jacquard machines.

2801. Léon Germain Riant, 39, Rue de l'Echiquier, Paris—An improved mode of preparing whalebone, gutta percha, and other elastic bands employed in the manufacture of wearing apparel.

2803. Matthew Henderson, Glasgow—Improvements in cutting, sawing, or shaping and polishing stone.

2805. Alfred Vincent Newton, 66, Chancery-lane—An improvement in the process of coating iron bolts, bars, sheets, spikes, nails, and other articles of iron, with metallic alloys, for the prevention of rusting or oxydation. (A communication.)

2806. Henry Eastman Palmer, Stonehouse, Devon—Improvements in photographic apparatus.

Dated 27th November, 1856.

2807. Asa Lees and David Schofield, Oldham—Certain improvements in self-acting mules for spinning and doubling.

2808. Peter Armand le Comte de Fontainemoreau, 39, Rue de l'Echiquier, Paris—Improved weighing apparatus. (A communication.)

2809. William Armand Gilbee, 4, South-street, Finsbury—An improved mode of reefing and reducing topsails. (A communication.)

2810. William Woofe, Weston Birt, Gloucestershire—An implement for paring land, applicable also to the removing of turf.

2811. Paul Rapsey Hodge, 4, Albion-grove, Barnsbury-park—Improvements in the manufacture of felted cloth.

2812. Henry Hedgely, 32, New-road, Brighton—Certain improvements in spirit lamps.

Dated 28th November, 1856.

2815. James Higgin, Manchester—Improvements in treating certain vegetable dye-stuffs, or preparations therefrom, so as to obtain a colouring substance of increased purity.

2817. Auguste Cellier, 39, Rue de l'Echiquier, Paris—Improved mucilage, applicable to the sizing and printing of textile materials.

2819. Henry Turner Sourbuts, Hyde, Cheshire—Improvements in taps or valves, part of which are applicable to lubricators for steam engines, and other purposes.

2821. Archibald Turner, Leicester—Improvements in the manufacture of elastic fabrics.

Dated 29th November, 1856.

2823. John George Taylor, Glasgow—Improvements in pencil cases.

2825. James Dryden, Dundee—Improvements in weaving.

2829. John Brown, Liverpool—Improvements in the construction of the lower masts of ships.

2831. Joseph Latimer Clark, Adelaide-road, Haverstock-hill, Hampstead—Improvements in electric telegraphs. (Partly a communication.)

Dated 1st December, 1856.

2833. Joseph Worthington, Manchester—Improvements in telegraphing and communicating on railway trains.

2835. John Christian Jones, 17, Poland-street, Oxford-street—The improvement of the common pin wooden leg and crutch.

2837. John Gedge, 4, Wellington-street South, Strand—Improvements in gas meters. (A communication.)

2839. John Gibson, Paddington—Improvements in buffing and drawing apparatus.

2841. Edward Jackson Emmons, Massachusetts, U.S.—A new or improved nursery chair. (A communication.)

2843. Francis Peabody, St. James's-street, Westminster—Improved apparatus for obtaining motive power by the action of the wind.

2845. Henri Nicolas Denis Bardot, Paris—Improvements in treating or preparing colours for printing.

Dated 2nd December, 1856.

2847. Edmund Dwyer, Woolwich—Improvements in the manufacture of children's chairs.

2849. John Longbottom, Leeds—Improvements in apparatus for drying, roasting, carbonizing, and calcining vegetable, mineral, and animal substances.

2851. Richard Archibald Brooman, 166, Fleet-street—Improvements in bleaching. (A communication.)

2853. Richard Archibald Brooman, 166, Fleet-street—Improvements in pumping engines and in pumps. (A communication.)

2855. John Fowler, jun., Havering, Essex—An improvement in the manufacture of wire ropes.

2857. Robert Dryden, Kinaston-street, Lambeth, and Stephen Miles, South-terrace, Willow-walk, Bermondsey—An improvement in the construction of cylinder printing presses.

2859. Alfred Bower, Liverpool—Improvements in or applicable to the keels of navigable vessels.

2861. Frederic Siemens, 7, John-street, Adelphi—Improved arrangement of furnaces, which improvements are applicable in all cases where great heat is required.

INVENTION WITH COMPLETE SPECIFICATION FILED.

2878. Ebenezer Daggett Draper and George Draper, Massachusetts, U.S.—New and useful improvements in oil feeders, vessels, or cans for oiling machinery. (Partly a communication.)—4th December, 1856.

WEEKLY LIST OF PATENTS SEALED.

December 12th.

1392. Philip Unwin and John Unwin.
1394. James Fairclough.
1414. William Seed.
1415. Edward Lindner.
1420. James Ball Mannix.
1434. Raymond Leopold De Berenger.
1435. Thomas Burton.
1449. Jacinto Dias Damazio.
1501. Gustave Durrich.
1531. Ebenezer Rogers and Herbert Mackworth.
1542. John Lacey Davies, junr., and John Broadbent.
1553. William Frederick Spittle.
1775. Isham Baggs.
1932. James Leach, William Turner, and John Tempest.
2294. John Holman.

December 16th.

1430. Frederick CollierBakewell.
1442. William Hunt.
1448. William Parsons.
1452. John Talbot Pitman.
1455. Jonathan Hague.
1468. Goldsworthy Gurney.
1502. John Gratrix and Alfred Knight.
1510. Basilio Scariano and Raphael Paul de Villamil.
1514. Charles Augustus Preller.
1518. George Henry Ormerod.
1526. Charles Armand Massager-Abit.
1536. Charles Woide Goodhart.
1554. Edwin Green.
1562. Alfred Vincent Newton.
1729. Clothide Amet.
1936. Henry Burden.
2096. Alfred Vincent Newton.
2217. Thomas Evans Blackwell.
2243. Thomas Holmes and Thomas Aspinall.
2252. Matthew Andrew Muir and William James Walker.
2360. Henry Watson and Joh Dixon.
2424. Jane Elizabeth Reed.
2430. John Mc Dowall.
2434. Alfred Vincent Newton.

Patents on which the Third Year's Stamp Duty has been Paid.

December 8th.

2859. Pierre Marie Fouque, Louis Réné Hébert, and Vincent Etienne Doret le Marneur.
2892. Christian Schiele.

December 9th.

2297. Frederick Crace Calvert.

December 10th.

2899. John Zuill Kay.
83. Auguste Edouard Loradoux Bellford.

December 12th.

2890. James Wansbrough.
2921. William Tranter.
2933. Charles Goodyear.
2942. John Greenwood.
2956. Josiah Latimer Clark.

December 13th.

2897. John Ambrose Coffey.
2912. Jean Baptiste Pascal.
2913. Frederick William Branston.

WEEKLY LIST OF DESIGNS FOR ARTICLES OF UTILITY REGISTERED.

No. in the Register.	Date of Registration.	Title.	Proprietors' Name.	Address.
3908	Nov. 28.	A Brougham................................	Cook, Rowley, and Co.........	King-street, Golden-square.
3909	Dec. 2.	Improved Angler's Winch Handle.........	William Deller	67, Crooked-lane.
3910	,, ,,	Clock or Timepiece Dial Plates	James Cooke........................	Birmingham.
3911	,, 3.	An Improved Mantle..........................	H. J. and D. Nicholl............	Regent-street and Cornhill.
3912	,, 5.	Glass Chimney for Lamps	William Palmer, jun............	Sutton-street, Clerkenwell.
3913	,, 6.	Mole Trap..	Samuel Griffiths	Wolverhampton.
3914	,, 11.	Rib for Umbrellas and Parasols	Samuel Smith	Birmingham.
3915	,, 12.	Anti-Garotte Boot Bayonet	Albert Delfosse	1, St. Swithin's-lane.
3916	,, 15.	A Spring Buckle.................................	Samuel Unite	Birmingham.
3917	,, 16.	Anti-friction Serving Mallet	Theophilus Westhorp	West India Dock-road
3918	,, ,,	Carpet Fastening................................	James Parkes and Son	Birmingham.

Journal of the Society of Arts.

FRIDAY, DECEMBER 26, 1856.

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IMPROVEMENTS IN MACHINERY.—RACES OF WORKMEN.—NOMINALLY LOW-PRICED LABOUR.

Sir,—As it has been put forth in the Society's *Journal*, by Mr. Bridges Adams, in his comments on a portion of my address at the Congress of Bienfaisance at Brussels, that people of France, Germany, and Italy "were willing to work for such small wages that the English manufacturers were cut out," I must request the insertion of the context of my address, containing references to parts calculated to disabuse his mind, and the minds of other employers, of the large fallacy that, as compared with Continental labour, English labour in general is dear labour. I know nothing of the manufactures of Spain; but from large manufacturers in France, Switzerland, Austria, Italy (several of them using the latest and the best of the English machinery), I know that, by whatsoever the English manufactures have been kept out, it has not been by the cheaper labour of those countries. In his comments, Mr. Adams dogmatises, as it appears to me, on assumed inherent inalienable qualities of races as workers, in a manner which is as unfounded as it is mischievous. As the subject is one of great importance, I beg to direct attention to those facts in the context, showing the different working of the same races under different conditions. Nothing is easier, or more common, than to say of a particular class of men, that they are of a particular race—*i.e.*, our own—and, therefore, infer that all is good about them; that another class are of another race, and therefore that they are essentially inferior, bad, and hopeless. I do not deny the force of hereditary conditions and habits which countenance such superficial generalisations, but I have seen that these conditions and habits may be much sooner, and more effectually altered, than is commonly supposed. I might adduce instances of classes of children of hereditary Irish mendicants, converted, by education and training, into orderly and steady productive labourers; of Saxons having the habits and inferior condition ascribed as peculiar to Celts,—and of Celts, working like superior Saxons; of trained and educated Irishmen, and also of trained and educated Welshmen, having been preferred in Scotland and England, as workers—and officers, for qualities, vulgarly assumed to be peculiarly Saxon—namely, superior steadiness and sobriety of mind; hovel-bred Irish emigrants, revolting against going in the same emigrant vessel with some German emigrants, on account of the filthy and inferior habits of the Teutons.

I regret to see such statements put forth in the Society's *Journal* as that, in Lancashire "nominally free people became slaves of the mill, as much as black men were slaves of the sugar cane;" the fact being, that they are as little slaves to the mills as any of the rest of the community who are compelled to labour for their livelihoods at some pursuit, whether manual or mental, or professional, are slaves in his sense to their respective occupations. His assertion, "that there can be no doubt of one fact, that spinners and weavers were either born or bred a distinct class from the general mass of British people, who gained their living by athletic and open air labour, that they are lower in stature, paler in complexion, more delicate in nervous organisation"—might as well be applied to tailors or shoemakers, or to lawyers' clerks, who present in these respects an unfavourable contrast to farmers. If he had informed himself of the origin of the cotton manufactures, he would have been aware that the workers are taken from the general local population; and that only when that population was insufficient were hands sought from a distance (also taken from the general population); and that cotton mills are frequently set up at a distance from the towns and markets, in rural districts, for the sake of the cheaper labour there obtainable from the rural population. Indeed, to meet a demand for additional labour in the mills, in 1836 I promoted a migration of agricultural labourers and their families from overburthened agricultural parishes in Buckinghamshire, and others of the most pauperised counties, who soon became good cotton workers, at double their previous wages. Instead of the hand-loom weavers being born and bred a distinct class from those who gained their living by athletic and open-air labour, the first were commonly taken from the class of small farmers, and examples may, I believe, yet be found of the primitive class who alternately tilled the field and plied the loom.

In machine spinning, I have understood that dexterity is required only for piecing the thread; and that its formation does not, as with the distaff, depend on delicacy of handling. Whilst machine-work does not exclude robust hands, it is its recommendation that it admits the labour of young persons.

In 1842, in the Report on the sanitary condition of the labouring population of Great Britain, I endeavoured to direct attention to the great extent of preventible mortality amongst artizans, and to the need of discriminating how much of this is due essentially to occupations, and what is separable from them: how much is due to the present habitations, and how much to the present habits. I showed that, the conditions of work in cotton mills being the same, there was one-fourth less of mortality amongst the operatives living in a rural, as compared with that prevalent amongst those inhabiting an urban district; that it made ten years' difference in the working ability, particularly in the duration of the eyesight, of a tailor, whether he worked with numbers in a London shop, or singly in a shop in a rural district,—in which rural shop there is still room for considerable improvement. Though warm air and, in particular hygrometrical conditions of the atmosphere, additional moisture, may be required for cotton spinning, it need not be, as it now too commonly is, impure air. The "pallor," the "lowered stature," the "delicacy of nervous organisation," are little due to the occupation, but mainly to the low state of sanitary science, and the want of architectural skill for its application. Indeed, in mills of a superior sanitary condition, as to ventilation, lighting, drainage, &c., the warmth and steadiness of temperature are found to be favourable to various complaints, as those of a scrofulous character.

In answer to Mr. Adams' representation, that "Lancashire cannot grow men and women, for if she ceased to import them they would disappear in a few generations, *i.e.*, men and women fit for cotton spinning," it is proper to give my assertion in the context, of the real condition of the general labour of that district, after all causes of deterioration (which no one, that I am aware, has more fully shown than myself)—that it is the seat of the foremost working population in Great Britain, of which I have strong evidence—such as of manufacturers having manufactories in other parts of the country, who, when they have orders to execute against time, always endeavour to get them executed in Manchester. The sons of strong six feet men in the rural districts may have been deteriorated in the towns to five feet ten inches, or lower, but in the judgment of the army surgeons, not many of them yet below the army standards, even by the particular occupations objected to as requiring and creating an inferior class; for I find, in Major Tulloch's last returns of the occupations of 22,000 pensioners, no less than five thousand seven hundred and thirty "weavers, spinners, and clothworkers,"—of which brigade it is well known that Lancashire will have furnished the largest contingent. Cromwell said of the Lancashire militia, that "finer soldiers or greater plunderers he never saw in battle-field." The Guards, who were acknowledged to have been the finest of the soldiers in the battle-fields of the Crimea, have usually been drawn in the greatest numbers from the seats of the navvies in Lancashire, with additions from the contiguous hill districts of Westmoreland and Yorkshire; and it will be acknowledged that, whilst they have maintained the character which Cromwell gave them as soldiers, they did nothing to revive the stigma which he fixed upon their ancestors as plunderers.

The members of the Congress, however, will acquit me of any intention of feeding provincial or national vanity, or of vaunting our strength. They will have been well aware that my object was to display some elements of progress, and to direct attention to the conditions by which strength was gained, and by which the weakly in this country, as well as on the continent, may be elevated. If those conditions should be found applicable to the Indian races, they will now be more free to apply them than ever, and may have the aid of British capital, —and for their home consumption there will always be the heavy bounty of the cost of transit half way round the world and back again, and various intermediate profits to be saved. But the supposed cheap labour of the Egyptians, probably of the race of the most primitive fine spinners by-hand labour, has not hitherto availed the efforts made to extend the cotton manufacture in Egypt.

As in speaking of the eldest living member of the House of Commons, as the father of the House, I should not be supposed to ignore Simon de Montfort, so in speaking of Mr. John Kennedy as the father of the cotton trade, few would have supposed that I intended to ignore Arkwright. I spoke of Mr. Kennedy as Mr. Bazley, the Chairman of the Manchester Chamber of Commerce, spoke of him in his address to the Society, and as Mr. William Fairbairn and others have spoken of him. The citation of him, as a competent authority, may be justified by reference to his papers "On the Rise of the Cotton Trade," and "On the Influence of Machinery," in the Manchester Philosophical Transactions.

I am, &c.,
EDWIN CHADWICK.

The following is the context of the address referred to:—

"It need not be enforced how strong is the interest which a nation has in the improvement of its agriculture; but I am a great advocate for agricultural improvement, for this especial reason, amongst others, that I have found, as a general rule, improvements in agriculture can only be effected through an intelligent and improved class of labourers. From particular inquiries which I have made in various parts of England, I am assured that in agriculture, as in manufactures, wheresoever labour-saving machines have been introduced, or labour-saving improvements in processes have been effected, more labour, of a higher quality, and better paid, has been required. At present, one great practical barrier to improvement in agriculture is the intractability, from ignorance and general low condition, of the labourers. It is a question, and a question overlooked in the consideration of the economy of sound popular education, whether there are not more successful inventions of machines and processes, especially in agriculture, unused than are used—essentially successful inventions and processes having been abandoned on account of the obstacles arising solely from the want of intelligent labourers to apply them. Thus the reaping machine was found to be an invention made a quarter of a century before, but abandoned. A friend of mine, an able mechanist (the late Mr. Smith, of Deanston) had invented one which succeeded in the field, but was destroyed in the barn by the ignorant carelessness of his labourers. At present, it is common for an agriculturist, after the inspection of a machine at the manufacturer's, to say, 'Well, if I buy that machine, you must find and send me a labourer to work it and take care of it, for I know of no one in my own parish who is fit to be entrusted with it.' 'But what wages do you give?' the machine-maker asks. If it is a Dorsetshire or a Buckinghamshire agriculturist, 'Eight or nine shillings per week,' will be the answer. 'But those wages will not do,' says the machine-maker. 'You can only get a labourer fit to be entrusted with that valuable machine at sixteen shillings a week.' And if the machine is taken, in one form or other the condition of the increased wages is generally submitted to; and so, under an impulse for economical improvement, improved labour is introduced.

"A quarter of a century ago there were agricultural riots, in which labour-saving machines were broken; and the popular violence was justified, and the use of machinery was discountenanced, even by members of Parliament. We are told that it is the political economy of the Chinese to prevent the use of horses in order to sustain the stock of labour for men; all they succeed in doing by this policy is, to make men do the work of horses, and in that respect to confine them to the condition of horses in perpetuity. In some of the agricultural districts in England better views have now begun to prevail, and labourers have refused to do thrashing work by the flail, because, as they have justly and laudably said, that was work for a machine, which they would not degrade themselves by performing. It is now a common effort of intelligent agriculturists to give their labourers an interest in the use and success of machines; and that interest, they find, must be improved wages or condition to the labourer. The most improved agricultural labour is conducted by well superintended labour, at piecework; and that description of work can only be well obtained permanently, by full payments, to sustain the interest in it; and that interest is, to a great extent, independent of the question of supply and demand.

"This is a topic which I believe to be of vast importance to the future of the labouring classes, though I have only the means of indicating some of its economical bearings.

"In treatises on agriculture by persons of authority, one or other course of agriculture is recommended to be adopted, as the labour is said to be dear or cheap. Now, from considerable observation in England, and from such information as I have been able to obtain, low-priced labour rarely is cheap labour, either in agriculture or in manufactures.

"An eminent manufacturer and successful manager of labourers stated to me, in the way of illustration, that it was with his workmen as it was with a valuable horse-power machine. 'I cannot,' said he, 'afford to work my machine with a horse that costs less than £30, or eats less than eighteen pounds of oats a day.' As it was with the horse, so it must be, under ordinary circumstances, with men—the eating the corn, the sufficiency of food and comforts, the existence of objects of desire, to create an interest in the work as a means of obtaining them, are becoming more and more positive conditions; for, whatsoever be the number of other horses in the market, the work will fall off unless the horse have his 18lbs. of oats. I have ascertained in England that in highly cultivated districts, where agricultural labour costs 14s. and 16s. per week, the work is, for quantity, as cheap as in districts where agriculture is lower, and where wages are only 8s. or 9s. a week. Nay, we have in my county—Lancashire—a class of workmen strangely called navigators, or 'navvies,' it is supposed from having been originally employed in digging canals and works for serving inland navigation. These Lancashire men work in gangs of five, and will admit no men into their gangs who cannot, as their minimum task, load twenty cubic yards or twenty single horse-loads, of earth in a day. I have known instances of men of this class, as a feat, doing even double that quantity. A mile of road made by labourers of this superior class, earning 3s., 3s. 6d., or 5s. 6d. per diem, has been executed in a much shorter time, and has been finished as cheaply as a mile of precisely the same sort of road done in Ireland by pauper labourers whose wages were only 1s. per diem. Common agricultural labourers, when they have been allowed to join these gangs of navvies, and have been 'alimented' and seasoned to their tremendous discipline, on their return have astonished the farmers by doing an ordinary day's agricultural work before noon, and by putting their spades on their shoulders, and going away for the rest of the day. My noble friend, Lord Shaftesbury, brought down to his estate in Dorsetshire a foreman accustomed to superior labour at piecework. Judging of what would be his answer, I said to this foreman, 'Will you not get this work done cheaply; here the labourers are got for only eight shillings per week? 'But *they* would be dear at *six*,' was the reply. 'How is it here with your other classes of artizans?' I inquired,—'your journeymen bricklayers, for example, what sort of workpeople are they?" 'Such as from their wages you, sir, would expect,' was the answer. 'And what wages are those?'—'About twelve shillings per week.' 'And how many bricks do they lay in a day?' 'Not more than between three and four hundred.' 'And how many do your town bricklayers lay, to whom you pay double wages?' 'More than a thousand a day!' was the answer.

"The same agricultural labourers on that estate, when put to piecework for draining, and made to earn nearly one-half more wages, were, by higher food, soon put into a superior physical condition. The labourers two years ago earning but 7s. a week, are now, through piece work at the drainage, earning many of them 15s., many 18s., a week; and these are hearty hale young men, who, at the beginning, openly stated their preference of 7s. a week with light labour, to twice the sum with increased exertion. Besides the labour which demands great vigour, there is the labour in agriculture which demands great skill; and skill is more productive than ordinary agriculturists are aware of. I was staying recently with a friend, an eminent and successful English agriculturist, Mr. Huxtable, who, whilst I was with him, saw a boy conducting a new spring waggon over the ridges and furrows of a field in such a manner as to endanger the waggon, when my friend ordered a man to take charge of it, and reproached his bailiff with his wasteful improvidence in entrusting so valuable a piece of machinery as that waggon and the horse to a boy. My friend observed, moreover, that an intelligent driver, who would load properly and conduct a horse carefully, was, for the saving of the horse as well as the machine, worth his double wages; that even in the common operation of digging, one labourer who was skilful was more profitable to him at 12s. than another was at 8s.; and so with other agricultural processes. The same eminent agriculturist has, with the aid of steam and improved machinery, processes and labour, brought the land of the average annual rentals of that country —namely, 5s., 9s., and 15s. per acre land—to an improved average value of 30s. per acre per annum; and this advance has been made with a return of 10 per cent. on the capital invested. Now there is no other reason than mere ignorance and routine why the whole of that country should not be cultivated in the like manner as this one portion of it. But if it were so, Dorsetshire, instead of being cultivated by only 16,000 labourers at only 8s. or 9s. per week wages, would require for its improved culture between 30,000 and 40,000 labourers, at 10s., 12s., 14s. and some of them 16s. per week. And this country is to a greater or lesser extent an example of what may be expected of agricultural improvement throughout the whole kingdom; and that improvement, whilst it must raise wages to the agricultural labourers, and remunerate the capitalist, would cheapen food to the general population.

"The most eminent of the 'navvies' in England come from the hill districts of sandstone-grit and granite in Lancashire and other northern counties, where there are favourable sanitary conditions of pure soft water and forced ventilation, and some natural drainage by winds and storms. Their alimentation, too, has been generally good. Some of the leading navvies have represented to me that they consider eleven pounds of meat per head per week, a necessary of life for good work; but I should not accept this as to the species of diet as an absolute dogma, for they, themselves, have admitted to me that eaters of oatmeal and potatoes (with milk), though in great quantities, have done good work with them; what, however, appears to be certain is, that a superior alimentation at the least is required, though it is by no means the sole requisite, and mental as well as bodily stimuli are needed for the attainment of superior work. M. Nidault, a French engineer, in his treatise on irrigations, gives the following account of a similar class of labourers to those by some deemed peculiarly our own. He describes as a most interesting class those who devote themselves specially to the execution of canals and other irrigation works in Italy. 'It is,' says he, 'that of the small contractors, or simple task-workers, who bring with them a gang of workmen, at the head of which they work, and by whose means they can advantageously contract for considerable works, especially digging or levelling. The digging of an irrigation canal, if rather a large one—one, for instance, of seven to eight metres wide, and which may also serve for navigation—is one of those works, which, to be well done, should be done with promptitude, or at best, without any delays, which requires that a number of workmen should be concentrated at one point. The resources of the locality being generally insufficient, they are obliged to seek labourers in the neighbouring districts, and prefer applying to the poor and populous countries such as Savoy and German-Lombardy. It is true that there they can find cheap labour, but at the same time the labourers are without vigour; and though they may be contented with small wages, they will also give very little work. I have always found the other system much better, which consists in employing those who gain high wages, but who also work well. There is not an engineer who would not agree with me on this point. There are some who would say that, in certain satisfactory results, obtained by different causes, this element has been the principal one of success.

"From time immemorial, the Piedmontese provinces of Ivrée, Brille, Varillo, and others, but *especially the high country near the lakes*, including the cantons of Arona and Bellazona, are in the habit of sending every year into other countries a considerable number of active and industrious men, who represent precisely this class of small contractors, the employment of whom has generally the best results. Many of these migrants are painters, plumbers, chimney-doctors, and decorators; but their most remarkable talent is that for 'navvying,' and for this qualification they are sought at great distances, as they will be wherever their work can be appreciated. In those *healthy* districts the peasantry have had for *a great number of generations substantial food*, as is generally the case in irrigated countries, where cattle are numerous. It is doubtless by these means that the Piedmontese 'navvy' is so indefatigable, and also exempt from the diseases that generally prevail amongst the labouring classes. I have seen them, without suffering any injury from it, remain twelve hours working in a deep cutting, with their heads uncovered, where the reverberation of an Italian sun would have been intolerable to men of any other mould. It is to be observed that they execute quickly and well whatever they undertake. To see them form a slope (*dresser un talus*), or dislodge a rock, either with the pickaxe or with powder, one cannot help asking—Are they not rather artists than labourers? For they have the secret of combining an extraordinary speed in the work they undertake, with the most perfect execution; and herein lies their great value. They will not accept work by the day; but it is not their habit to work lazily, and even the highest wages barely remunerate their labour.

"The most skilful of these labourers—those who have saved a little money—become contractors, or task-workers. They have a gang of twenty-five to thirty, or even a 100 to 150 picked men, that they take with them wherever they are required, and undertake works of great importance for a fixed sum. If more workmen are needed than the gang contains, the contractor sends for more. He knows exactly where to apply in case of necessity. They know certain villages in Germany where they go to recruit their gang, as the officers of the army go for their horses. 'This class of men,' says this French engineer, 'is entirely wanting in France, and it ought to be formed and encouraged.'

"In England I have written pamphlets, and got a parliamentary committee of inquiry, and done whatsoever was in my power to prevent the valuable class of labourers which we have already formed, though rudely, from being deteriorated and destroyed by the reckless and discreditable administration of railway works. I observed also, and endeavoured to call attention to the fact, that the sons born in towns from these hill district labourers were shorter and less strong than their parents, and that the parents who came to reside in the towns, in consequence of the defective sanitary administration there, lost on the average about ten years of working ability, as well as of life; and that of the fine children born of this class in the towns more than forty per cent. were destroyed by preventible disease before their fifth year; but hitherto the efforts of powerful friends, with myself, in this case, have been only of partial effect.

"I may observe, *en passant*, that I have been informed of one other similar class of labourers to our navvies, the *terrassiers*, who come from near the Polders, of whose condition I have not obtained particular information; but English navvies have been much employed on railway works in France, and have earned as piece-work from 7fr. to 8fr., and in some instances as much as 10fr. per diem; and they have also in various parts of Germany earned double the best labourers' wages there. And this superiority, I may say, of a highly alimented and skilled labour, has been maintained in every clime. A friend of mine, a civil administrator in India (the Right Hon. Holt Mackenzie), informed me some time ago, that he had made a note of the comparative cost of Indian, Chinese, and English labour when he was in India, and that the general result was, 'that for some works an English workman, of average efficiency, was equal to several Chinese, and one Chinese equal to several Indians (Bengalese); and this independently of the advantage or disadvantage of the tools employed. And the conclusion I drew,' said he—and the conclusion which, I too, wish now to enforce—'was, that for estimating the cost of labour, or of the work done, there could not be a worse standard than the wages of the labourers.'

"Much in this instance might be ascribed to the climate; but the spectacle has been presented in Calcutta of Lancashire artizans, imported at high wages, doing work there under the shade of umbrellas held over them by Hindoos, engaged at low wages to attend and perform this service. Labourers of our Army Works Corps speak with respect of the capabilities of the Turkish labourers, and of particular feats of strength performed by them; but Mr. Rawlinson, our sanitary engineer, declares to me that the Croat labour, chiefly engaged by us in the first instance, was dear at sixpence per diem; and that in relation to the works performed in the East, by whatsoever race, it would have been far cheaper to have taken out highly paid and trained English labourers and materials, all the way from England, for the execution of the works. In the course of discussions on the subject with the members of the congress met here, I have received much testimony confirmatory of my view of the facts. One member of the congress, a merchant, informs me that he has had ships built abroad, and also ships repaired in every principal port of the world; but he avows that notwithstanding the very high wages of our shipwrights, he has found their labour as cheap as any he has elsewhere met with. In respect to agricultural labour, another of our colleagues, a land owner in Poland, who has been some years in England, and who has studied its agriculture, states to me that he found one German labourer equal to two Polish labourers; but that three Polish labourers—and those not serfs —were required to do work equivalent to one average English agricultural labourer. In this extreme difference, however, the difference of tools was included with the difference of skill and energy. Another Polish gentleman here, who studied at the English Agricultural College at Cirencester, states to me that he compared the expense of the ploughing done there by ploughmen at 14s. per week wages, with an equal quantity of ploughing done on his father's estate in the accustomed way there, and he found that the work done at Cirencester had the advantage in cheapness. On a particular comparison made in Normandy, the labour of three Norman agricultural labourers was found to be equivalent only to that of two English, or more particularly two Kentish labourers; and from other information which I have received from engineers, confirmed by members of the present congress, about three Danes, or Norwegians, or Swedes, would be required to do the same quantity of work as two average English labourers. Superior workmanship, as well as quickness of execution, with the aid of superior tools, will frequently tend to augment the value of the English labour beyond the difference of the gross produce. Admirable work is done by Anglo-Saxon men in Canada, and in the United States of America; but I repeat, that I do not ascribe the difference of result mainly to race, because, as I have observed, the labour of Englishmen, depressed by maladministration and pauperism, is often as inferior as any other; and because depressed Irish labourers, when put into suitable training and condition, are found, according to the acknowledgment of English labourers, to keep step with the best. Indeed, in the Crimea, under the directions of our army administration, the ordinary labour and tasks of earthwork required from soldiers—raised chiefly from those same districts from whence the best navvies have been obtained, and acknowledged by impartial observers to have in physique no superiors amongst all the troops in the field—were only to remove ten cubic yards a day in a loose soil; that is to say, that at least two soldiers were required to do the work done with an interest and a will by one navvy—the navvy very often the brother or relation of the soldiers, or coming from the same villages.

"I am glad to find that the general observations of the most eminent continental agriculturists—of Count Gasparin in France, of Van Thüer and Burger in Germany—are in accord with my own in England—I regard the economical element which those facts display to be of the greatest social and political moment; for on this economical element will depend, not only the extinction of every form of serfage, but of slavery itself. I have been consulted on drainage as sanitary works by proprietors in the West Indies, and have had some insight into the slave labour there; and I am convinced it is dear labour, as contrasted with the white free labour. Slavery will sooner fall with our brethren in America when they find it, as they eventually will do, as compared with improved free labour culture, bad as an investment, than by any amount of condemnation of it, as being bad as a social institution. It appears to me that Count Gasparin justy cites, as an instance of the power of free as against slave labour, the fact that the manufacture of sugar from the beetroot keeps it ground; that is to say, that the slave (or the slave bred labourer), with a plant containing 18 per cent. of sugar, grown in a superior climate, has great difficulty in contending against the free labourer, who cultivates a plant which contains only 8 per cent. of sugar, in a climate most unfavourable to its development.

"In England, I have known agriculturists from the most advanced districts of the North, tempted by the cheaper land, the apparently cheaper labour, and better climate of the South, go there to take farms which were in the market; but when they have examined the quality of the labour there, they have declined the enterprise. I am happy to find that Count Gasparin has made analogous observations. 'One day,' says he, 'our worthy and excellent colleague, M. Huzard, being consulted on the expediency of the purchase of some land in a certain canton of France, answered, 'Beware! you will not get from land there the promised return. I know the men of that country; they want activity; the pupils who come from it to our veterinary school do not strike hard upon the anvil!'' 'What fine and just appreciation!' exclaims the Count. There, where the labourer's arm is enervated, whether by physical debility, arising from a bad regime, or by long habits of idleness—there, where they do not strike hard upon the anvil, the value of the land is affected by their depression! Of old our forefathers said, 'Tant vaut l'homme, tant vaut la terre'—(as is the worth of the labourer, so is the worth of the land)."

ON SOME NEW METHODS OF TREATING LINSEED OIL AND OTHER DRYING OILS, FOR IMPROVING THEIR DRYING PROPERTIES, IN THEIR APPLICATION IN PAINTS AND VARNISHES.

Sir,—The necessarily prescribed limits—the three-quarters of an hour's time-measure—of any paper to be read before the Society, led unavoidably to the omission of much that otherwise it would have been desirable to have included in my late paper—to the omission, then, of numerous details of experiments, of processes, of the preparation of materials, of tabulated results, and of the history of researches made independently by others in the same or in a similar direction, either concurrently with or subsequently to my own, and to the period more especially referred to in my paper—as the history of those by M. Chevreul, published in 1850; of those by MM. Baruel and Jean, in 1853; the excellent lecture delivered by Mr. Calvert at Marlborough House, and the share which that gentleman (along with Mr. Hart) has had in bringing before the public the elaborate researches on oil painting of M. Chevreul. I beg, therefore, in reply to the inquiries of Mr. Hooper and others, to add to the original paper a few necessary details, merely premising that these too, must necessarily be very limited, when compared with the extent of the subject, which I hope to be able shortly to complete in a more extended publication—now in hand—on the whole chemistry of the drying oils. I am, &c.,

CHRISTOPHER BINKS.

VI.—*Choice and Preparation of Reagents.*

It has already been said that out of those of the hydrated protoxides which have been found to exercise this specific action upon the oil, it is that of manganese which is to be selected in preference for all practical purposes. It is the fittest, because its reactions either lead to, or do not interfere with, the important issue of the final *bleaching* of the oil; and because of the extreme facility with which it, or its salts, can be obtained commercially. Several of the salts of this protoxide admit of being used for either the preparation of the hydrated oxide itself, or for its elimination, so that the salt is mixed with the oil, and is there brought in contact with some other agent to decompose it; that is, in the latter case, when there is brought to bear upon the oil the *nascent* actions that accompany the liberation of the oxide when in actual contact with the oil. For the preparation of the hydrated oxide, or for its liberation *nascently*, there may be used, at pleasure, the muriate of manganese, or the sulphate, the nitrate, the acetate, the oxalate, the borate, or others; but for all manufacturing purposes, it is from the muriate alone that the hydrated oxides should be prepared, and it is through the medium of the sulphate alone that all the *nascent* reactions brought to bear upon the oil should be accomplished. In the manufacture of chloride of lime occurs a residue, for which there exists at present little or no use. This residue is consequently a comparatively waste product, and is daily cast away in immense quantities. It is an impure muriate of manganese, and is run out of the chlorine stills as a liquid, but on being "salted down," as it is called, can be obtained imperfectly crystallised for about £3 per ton. It contains always, a considerable quantity of iron, but this in a condition, viz., that of the permuriate, that admits of an easy separation, and consequently, of the manganese muriate, or other salt, or of the hydrated protoxide, being obtained from it of sufficient purity easily and economically by the following method:—A solution of the salt is boiled along with a little carbonate of manganese, which throws down the whole of the iron present in the form of an insoluble peroxide. To the remaining solution of muriate of manganese is added caustic soda, which throws down the hydrated protoxide of manganese, in a condition fit for immediate use in these oil operations, in those cases in which it is perferred to employ the hydrated oxide direct, and not to eliminate it *nascently* from the sulphate. When the sulphate itself is required, then to the hydrated protoxide produced as just stated, is added sulphuric acid, and the sulphate is immediately produced. For practical purposes this sulphate may remain in solution, or the excess of water present be evaporated off; and thus be obtained the beautiful rose-coloured crystals of the sulphate of manganese. This salt crystallises according to circumstances, with five or six waters of crystallisation. It effloresces on exposure to air, and the water in it subsides finally into four equivalents; and this latter is the most favourable condition in which to employ this salt, when it is preferred to use it ground up in its *solid* state with, and not to add it in *solution* in water to the oils. The crystallised sulphate so made can be manufactured for about from £12 to £18 per ton, that is, at a cost of from 1½d. to 2d. per lb. That with which the writer has hitherto carried on his large operations, was made by the Messrs. Haddock, Parnell, and Co., of Prestatyn, was perfectly free from iron, and cost only £20 per ton; and considering, besides, the exceedingly small proportion required in the operations, it will be seen how perfectly unobjectionable or even insignificant is the *cost* of these reagents. There are, of course, other well-known methods of manufacturing the sulphate of manganese; but that given above subserves two purposes—the production, at pleasure, of pure (that is, free from iron) hydrated protoxide, or of the pure sulphate; and by a proper management of these two agents, all the varieties of these new oils are to be obtained.

Why, in preference to this so readily obtained, and so cheap a salt, there should, by certain foreign chemists, (by the Messrs. J. Collin and Co., of Breslau, Silesia, alluded to by Mr. Hooper, and by MM. Baruel and Jean, of Paris, who, in their paper in the *Comptes Rendus*, in 1853, announce their preference) be made the singular choice of the *Borate* of manganese, a salt comparatively expensive and exceedingly inactive in its reactions, is scarcely to be accounted for.

VII.—*Some Details of Reactions and of Processes.*

The impolicy of adding to a paint itself, after the usual manner of a *drier*, the hydrated protoxides of manganese (or of any other of the class), or of liberating this oxide in the paint itself, by addition to the paint of some salt of manganese, will be made apparent by the following considerations, which show that it is the placing of the oil itself in a drying attitude, and the complete removal, before its admixture with the pigment, of the agents used to effect this, that we should attempt; and that we should not continue to add, after the manner of driers, these agents of change to the paint itself, and to leave them there, for in every instance such driers or additions injuriously affect the normal and the finally intended condition of the paint.

A *paint* consists of a *pigment*—the colour-giving element—and of its *vehicle;* which in the case in hand is the oil; and this vehicle should be such as in no way to interfere with the full development of the proper colour of the pigment; therefore the vehicle, if a perfect one, should itself be altogether free from colour, or be of precisely the same colour as the pigment, and, of course, to such a mixture, if we would preserve its normal condition, there should be superadded no other material calculated to interfere with the full development of the colour of the pigment. In like manner should a *varnish proper* (when not intended itself to give colour, or to modify some other colour, but merely to constitute a superficial covering, or to give a special art effect having no relation to mere colour) when a perfect one, be free from colour, so as in no way to interfere with the full effect of the underlying stratum, the pigmentary element of which has to throw out its colour through the medium of the overlying varnish.

Now, if we examine the action of these hydrated protoxides when substantively added to any paint, that is, in the form of mere *driers*, it will be seen how they must necessarily exercise an injurious action upon all paints that are lighter or are not exactly of their own colour, or of the colour they finally arrive at, and how necessarily it follows also, that a dark-coloured and non-bleaching oil, such as our ancient acquaintance, the old "boiled oil," must be altogether unfit for a varnish proper.

This hydrated protoxide of manganese, when fresh and pure, is *white* in colour, but passes speedily, by absorption of oxygen, into a *deep brown-coloured*, or nearly *black* oxide, ending finally, chemically, in the formation of the sesqui-oxide—which is nearly *black.*

$$\text{MnO, HO (white)} + \text{O} = \text{Mn}_2\,\text{O}_3\text{, HO (brown or black).}$$

When, therefore, the borate, or any other salt of the protoxide of manganese, say, the sulphate, is ground up with a paint, the pigment or some other element in which is capable of decomposing the manganese salt, there is liberated the protoxide; which in time (and often very speedily) passes into the sesqui-oxide; and this last oxide remaining there in this condition, leaves the paint finally and permanently tinged brown or black, the deeper in intensity in proportion to the relative quantity of the salt used.

Take the instance of the addition of the borate, or say, of the sulphate of manganese to oxide of zinc paint in order to effect the drying of the zinc paint.

First stage.

$$\text{ZnO (in excess)}, + \text{MnO, SO}_3\ \text{HO} = \text{ZnO (in excess), ZnO, SO}_3\text{; MnO, HO (white).}$$

Second stage.

$$\text{ZnO (in excess), ZnO, SO}_3\text{: Mn}_2\text{O}_3\text{, HO (dark brown or black).}$$

If the proportion of the manganese salt thus employed be so small as finally not materially to affect the colour of the paint, then its addition in this proportion does not operate as a drier at all. But, if used in a proportion sufficient to operate as an efficient drier, then its addition becomes fatal to the colour or to the brilliancy of the paint.

It follows, therefore, that an oil paint so composed comes out, and that very speedily, not white, but yellowish-brown, or brown, or black, in accordance with the relative proportions of materials.

The employment, therefore, of the hydrated oxides, or of the salts of manganese substantively, to mix with paints as driers, is a practical fallacy. It is the same with the borate and with all the other salts of this metal, and with the whole of the hydrated protoxides of the class that exercise this drying action upon the oil. It is the same with the preparations of lead that find their way, or issue out of the reactions of common driers, for these develop darkish-coloured compounds finally, due to and peculiar to the oxides of lead, or due to the impurities in the white copperas or in the acetate of lead used. White paints so mixed speedily assume a yellow or brownish-yellow tinge, even when no portion of this darkening can be traced to the action upon the lead of sulphuretted hydrogen. It is upon the oil itself, as a preliminary and distinct operation, in order to place it in a drying attitude, that is, to remove its colouring matter, to initiate the drying action, and to leave the oil free to the natural after reactions with the atmosphere and the other external agencies, that these preparations should be applied conjointly with the after action of the atmosphere; and every particle or trace of these intermediate agents should be (and is under some of those new methods) removed from the oil previously to its application in the composition of the paint or of the varnish.

Out of the discovery of this specific action of the hydrated oxides, there came an unlooked-for explanation of a well-known but previously anomalous fact, namely, the singular superiority for drier-making of the Hamburgh over British-made white copperas. Whilst the former was found to contain considerable quantities of both the sulphates of iron and of manganese, the latter is comparatively free from such; and to the reactions between these and litharge, and the consequent formation of the hydrated protoxides, is due the superior drying action of the Hamburgh copperas—and hence, in future, it is necessary only to add to the British a small per centage of sulphate of manganese to make its value, for these purposes, if valuable at all, equal to that obtained from the Continent.

VIII.—*Some Concurrent or Subsequent Researches by others in the same or in Similar Directions.*

The time, "now some years ago," as it is expressed, which is referred to in the former part of this paper, as that "when these investigations were first entered upon," and as that up to which there was to be found nowhere any accurate chemical history of the peculiar changes the drying oils undergo in the act of drying, &c., was the time that intervened between the period of Berthollet, of De Saussure, and the epoch—for such it became in the history of chemistry—of the original researches of M. Chevreul on the oils and fatty matters, and the year 1850. The earlier researches of the former chemists left the present question in an utterly inconclusive position, whilst the ever-famous ones of M. Chevreul himself on the oils and fats in no way touched upon it; nor did that chemist touch upon it till the year 1850, when his *Mémoire* on oil painting appeared. That there was, previously to 1850, to be found on record no systematised examination (as it is expressed by the writer), is a fact to which there could scarcely be desired a more complete testimony than that appearing in the circumstance that M. Chevreul himself, about this latter period, found it necessary to enter upon the long course of experimenting, the results of which he gives in a *mémoire* read before the *Académie des Sciences* on the 8th of June, 1850, but of course, not actually published for some considerable time after that.*

The writer began his experiments upon the phenomena of the drying of linseed oil, and for, if possible, devising some new and improved industrial method of treating the oil, in 1849, and he had fully completed his work, so far as related to the discovery of the specific action of the hydrated protoxides by January, 1850. But it was some considerable time after this that the writer worked out, as an *industrial* scheme, the combined operations of these hydrated oxides and of atmospheric air, when the latter is mechanically applied to the oil, which for some time past (the work solely of the writer) has existed as a completed process of manufacture, and is destined, unquestionably, to effect, either through his labours, or more probably through the conjoint labours of many, a complete change in this section of manufacturing chemistry.

It is singular that the researches of M. Chevreul, those of the MM. Baruel and Jean, and those, also, of the writer, had their origin under exactly the same circumstances, and out of the same necessity, viz., that which previously to 1850 had arisen out of the introduction, as a pigment, of oxide of zinc, and the demand there followed to effect the drying of its paint without the intervention of preparations of lead.

The late Mr. Knowlys, of Heysham Tower, Lancaster, being interested in the manufacture of zinc, requested the writer to devise some mode of drying the paint without the use of lead driers. The experiments, began in the autumn of 1849, were, from time to time, communicated to Mr. Knowlys, and finally the specific action of the hydrated protoxide of manganese, as developed from the protosulphate of manganese, through its reaction with the oxide of zinc, or with lime, or other matters, was shown experimentally to that gentleman, in London, in January and in the beginning of February, 1850. About the same time, and subsequently, but long before 1853, the same fact was freely communicated to several people—to the Messrs. E. B. and A. T. Pitchford, of London, to Mr. Thos. Hubbuck, of London, and to many with whom the writer met at the Great Exhibition of 1851. The Messrs. Pitchford, to whom the writer had applied for any date they might have of experiments with the hydrated protoxide of manganese shown at their works (and for which the sulphate of manganese was used, and was bought by those gentlemen), in a letter just received, say:—"In reply to your favour of this date, we have searched our books, and find that on May 21st, 1851, we purchased, under your direction, sulphate of manganese, for the purpose of making experiments on the drying of linseed oil by your new method."

MM. Baruel and Jean announce in the *Comptes Rendus* for March, 1853, their discovery of the peculiar action upon linseed oil of the hydrated protoxides of certain of the metals, especially of manganese. These gentlemen, obviously aware of some practical difficulty in the way of using these ready prepared, revert to the possibility of using their salts, but it is remarkable that they in no way intimate their perception of the fact that, through the reactions between these salts and certain decomposing agents, these hydrated oxides may be eliminated *nascently* in contact with the oil itself, and thus be realised their peculiar effects.

Now, the writer was in possession of the knowledge of those reactions at least some two or three years previous to 1853, and in possession besides of very much more relating to the practical application of the method of producing them by reactions with their salts, whilst in contact with the oil, and the conjoint or after-action of atmospheric air mechanically forced into the oil, and constituting a set or series of operations now complete. But these independently conducted researches of MM. Barruel and Jean—those of M. Chevreul, so far as identical—and those of the writer, carried on doubtless by each, without the slightest knowledge of the fact that a like or an identical line of research had been or was being pursued elsewhere, is only another instance—and a very happy one—for it tells its own tale of a common requirement giving birth to a common desire appearing in action in most remote and unlikely quarters—of the oneness both of the path and of the issues of scientific truth. It tells that the laws of matter are still—as they have ever been—the same, whether sought for in Paris or in London; and that the expressions of them must necessarily be identical, if expressed truly; and it tells that the co-issue in explanation of some of these phenomena—as these explanations are given in common by these French gentlemen and by the writer, which Mr. Calvert in his letter hints at as being "extraordinary"—(that is the coincidence of explanations)—is, in fact, not extraordinary at all. It would, in fact, only be extraordinary did the two explanations differ.

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* Recherches Experimentales sur la Peinture à l'Huile, par M. E. Chevreul. Tome XXII. des Mémoires de l'Académie des Sciences. Paris, 1850.

Between the primary object that M. Chevreul had obviously proposed to himself in his researches previously referred to, and those the writer had in view in the course of experiments carried on, as it appears, concurrently, but with no knowledge whatever of the fact on either part, there is to be observed a remarkable distinction and an equally remarkable difference in the results respectively arrived at.

The primary object of M. Chevreul was an investigation (to be conducted with all the skill, all the chemical knowledge, and the untiring perseverance to be looked for in so eminent a quarter), into the general phenomena of *oil painting*, in the course of which the special phenomena involved in the act of the drying of the oil, of its mode of preparation, and of any deductions tending to improvements in such modes, formed only sectional parts, and not the primary object of the whole,—whereas the primary and sole object of the writer in his investigations was, if possible, to discover and to determine with precision the whole phenomena of the drying of the oil, and upon that knowledge, if arrived at, to found some new method for its industrial production. The innumerable interesting phenomena, the surface developments, the molecular disturbances, the "flatting" and the "glossing" actions alluded to by the writer in his paper, were the incidental, not the primary, objects of his experiments. Whilst there is an inevitable resemblance, on some few points, in the *modes of research* adopted by M. Chevreul and by the writer, there is, at the same time, sufficient internal evidence in M. Chevreul's *Mémoire*, and in the well-known results of the writer, to mark the totally independent and different line of action of each. The writer's conclusions (shortly to be published in a forthcoming work on the "Chemistry of the Drying Oils") are in many respects widely different from those up to this period announced by M. Chevreul, whilst the writer's new methods of treating the drying oils for their manufacture, are altogether different from any appearing in this *Mémoire*, in which there is not the slightest indication (that is, up to June 8th, 1850), that M. Chevreul was aware of the specific action of certain hydrated protoxides, or that out of this fact, combined with the after action of atmospheric air, there could be obtained so happy a set of processes for the manufacture of the drying oils as it has been the good fortune of the writer to have arrived at, and to have perfected. For the fact that no such or any similar conclusion had up to this time been arrived at by M. Chevreul, there is another and a collateral kind of evidence, besides the positive one of the contents of M. Chevreul's *Mémoire*, viz., that the making of so effective a revolution in a branch of chemical manufacture as the writer's discovery and applications are bringing about, would scarcely have escaped the vigilance, the skill, and the ambition of Mr. Calvert himself, had the "master's" labours either directly stated, or suggestively shadowed forth to the pupil, the chemical facts upon which this movement, originated and followed out by the writer, is founded.

But M. Chevreul's own summary of results at the end of his *Mémoire* gives the exact extent of the practical suggestions for any improved process upon the oil itself that his previous researches had suggested. His conclusions are given in his own words. After stating that his experiments demonstrated the desirableness of some alteration in the system, on account of the cost of fuel, and of the colorisation of the "boiled oil," M. Chevreul says:—

"Puisqu'en effet j'ai démontré.

"1. Qu'une exposition d'huile à une temperature de 70° pendant 8 heures, augmente très sensiblement la propriété siccative.

"2. Qu'en ajoutant du peroxide de manganese à cette même huile chauffée de la même manière, on la rend assez siccative pour s'en servir.

"3. Qu'il suffit de chauffer une huile de lin pendant 3 heures à la temperature ou l'on opère généralement en des laboratoires de marchands de couleur avec 15 d'oxyde métallique pour 100, lorsqu'on veut obtenir une huile très siccative."

And this, if considered as a response to an urgent industrial requirement, such as that existing in the year 1850, amounts, it must be confessed, to nothing. It is merely the applying to the operation and to the old material—the protoxide of manganese—a degree of heat lower than the usual one.

IX.—*Some Special Varieties of the Oil, and Modes of Preparation.*

A drying oil would be perfect in all desirable qualities, were it free from colour, did it dry, *per se* (that is, solidify), in a reasonably short time on mere exposure to air and to other atmospheric influences, without necessity for addition to it of any other matter to hasten that result; and when thus solidified, did exhibit a compact, hard, and transparent body, and an uncrisped, smooth, and resplendent (that is, glossy) surface.

Now, some of these new processes take from linseed oil its colouring matter, and in other respects purify it entirely, whilst they leave it in a drying condition, more or less active at pleasure, without there having been added in the processes, or there being left in the oil, any foreign matter whatever, calculated to exercise any injurious action, either upon the oil itself, or upon any material mixed with it in its after applications. But it is well-known, both to artists, to decorative painters, and to varnish makers, that innumerable injurious reactions are brought about in their work by the use of the lead-prepared drying oils, with lead left in them, and of the sulphuric acid for refined linseed, through the peculiar condition in which the oil is left after the application to it of the acid and the steam.

Now, however valuable and desirable, for innumerable purposes, is such absolutely pure drying oil as that just referred to, there exist innumerable other applications in which it is neither necessary nor desirable that the oil should be so pure—in short, a multitude of cases in which it is rather advantageous than the contrary that there should remain in the oil the materials, or a portion of them, that have been used to impart to it its drying properties. Therefore, in the following tables are given formulæ for the preparation of any or of all of these varieties at pleasure.

By means of a simple but very elegant apparatus, any artist, or oil experimenter, can prepare for himself any of these varieties of the oil, and can, without inconvenience of any kind, carry on the operations in an ordinary apartment. He can operate upon a pint of twenty ounces, or upon a gallon, or several gallons, with very nearly the same beneficial results that are attained by the Messrs. Wilsons, of Liverpool, who, beginning with two-gallon operations, now prefer to operate upon five tons at a time.

The experimental apparatus which the writer uses is a stout copper pan, tinned inside, of the capacity of three gallons, but capable of working upon one pint or upon any intermediate quantity. It stands upon the table of his laboratory, is gas-heated to any degree, at pleasure, or if necessary is not heated at all, and is, at pleasure, attached to a "number one" smith's forge bellows, for sending into and through the oil the volume of air needed for these experimental quantities. Furnished with such an apparatus, with his raw oil, his thermometer, and the few reagents he requires, the experimenter in oils will have provided for himself no little source of interest in watching the peculiar changes in the oil that follow under the influence of the addition of the different materials, of different proportions of them, of different degrees of heat, and of the greater or less quantity of air sent into it.

The operations upon the oil may terminate at one or other of four different and successive stages:—

1. At the point when the re-agent used to remove the colouring matter, and initiate the drying action, has been added to and been dissolved in the oil; and this is called the *solution*.

2. At the point when through this solution there has been passed as much atmospheric air as raises the colour of the mixture to its maximum point; and this is called the *browning* of the oil, or its aëration up to the *browning* point.

3. At that point, when, through this *browned* oil there has been passed as much more atmospheric air as is required completely to *bleach* it; and this is called the *bleaching* point, or the aëration up to that point.

4. At any point when, following successively after the solution, the browning and the bleaching, it is required, by a still further addition of atmospheric air, to give to the bleached oil various degrees of thickness or of viscidity; and this is called the *thickening* point.

Now, those distinctions, that possibly may at first appear almost too minute, are, in fact, of the utmost practical value and importance, and in practice resolve themselves into results the most simple and convenient. The *solution* is applicable in innumerable painting and waterproofing work, where colour is no object, and its preparation costs almost nothing. The *browned* oil is of use for like purposes, and is a more rapidly drying oil. The *bleached* is the very perfection of a painter's oil. And the *thickened* is of itself a fine varnish, and has besides, unnumbered uses among artists, among varnish-makers, coach-painters, and very many others.

In order to tabulate the results of different methods of treating the oil, as those results appear in corresponding differences in the colour, in the degree of viscidity, in the specific gravity, and in the rate of drying of the oil, it is necessary to establish and adopt some standard of comparison. Good ordinary *refined* linseed oil is taken as one standard of colour, and is numbered 1. When the oil is lighter in colour than this, that degree is expressed as 0, that is, as having no colour whatever. Ordinary raw linseed oil is represented as 5, and the dark boiled oil as 10, on the scale. The drying rate is expressed in *hours*, which is (as explained in the former part of this paper) its rate, *per se*, under average external conditions.

There are two main classes of these oils, each class admitting of the production of the varieties of its kind that are enumerated above. These classes are—

1st. Those prepared by means of the hydrated protoxide of manganese alone, as the reacting agent, either with or without aëration.

2ndly. Those prepared by means of both the hydrated protoxide of manganese and the protoxide of lead, as the agents of reaction, and with the latter in *excess*, so as to leave the lead as well as the manganese oxide in the oil finally.

From a set of greatly more extended tabulated results, two examples are abstracted, as follows:—

Table (No. 1) of Relative Proportions and Effects.

The reagent used here is the hydrated protoxide of manganese, containing, in all, 50 per cent. of water. When of this, there are added

	There results an aerated oil, in colour.	In drying rate.
To the ton of oil, $2\frac{1}{2}$ lbs. To the gallon of oil, 70 grs. To the pint of oil, $8\frac{1}{2}$ grs.	= 0	= 15 hours
To the ton of oil, 5 lbs. To the gallon of oil, 140 grs. To the pint of oil, $17\frac{1}{2}$ grs.	= 1	= 12 hours
To the ton of oil, 10 lbs. To the gallon of oil, 280 grs. To the pint of oil, 35 grs.	= 3	= 10 hours

That is, the *first* proportions yield an oil lighter in colour than ordinary *refined* linseed oil, and which dries in fifteen hours.

The second proportions yield it of the same colour as *refined* linseed oil, but drying in twelve hours.

And the third proportions yield it of a colour between that of the refined and the raw oil, but drying in ten hours. The temperature used is from 80 to 100 deg. Fahrenheit.

Table (No. 2) of Relative Proportions of Effects.

The reagents used here are the crystallised sulphate of manganese, and the anhydrous protoxide of lead, the latter in *excess*.

OIL =				Colour when aerated.	Drying rate.
	Ton.	Gallon.	Pint.		
PbO.............. MnO, SO_3 HO	5 lbs. $2\frac{1}{2}$ lbs.	140 grs. 70 grs.	$17\frac{1}{2}$ grs. $8\frac{3}{4}$ grs.	= 1	12 hours.
PbO.............. MnO, SO_3 HO	10 lbs. 5 lbs.	280 grs. 140 grs.	35 grs. $17\frac{1}{2}$ grs.	= 5	10 hours.
PbO............. MnO, SO_3 HO	14 lbs. 7 lbs.	392 grs. 196 grs.	49 grs. $24\frac{1}{4}$ grs.	= 6	7 hours.

That is, the first proportions yield an oil of the colour of refined linseed, and drying in 12 hours *per se*.

The second yield an oil of the colour of raw oil, but drying in 10 hours *per se;* and the third yield the oil of a fine amber colour, drying *per se* in 7 hours.

From these short tables are necessarily omitted many other particulars, as the relative drying rate and colour of the *solution* and of the *browned* products, as well as of those of the *thickened* varieties; but these will be sufficient to indicate the great variety of oils this new method gives us the power to produce.

The writer would mention only one other fact relating to the production of a permanently dark-coloured oil in imitation of the old boiled oil, which he contrived, in order to gratify some who would still adhere to the old colour, and to the employment of a high temperature:—Grind up with the oil some nitrate of baryta and sulphate of manganese, and heat the mixture to about 400° Fahr.; the result is the production of a deep reddish-brown coloured and tolerably good drying oil, but one that never *bleaches*.

Now, here we have reactions, which, at a high temperature, and when out of contact with the oil, issue in the following:

$$\begin{gathered} \mathrm{Ba\ O,\ NO_5 + Mn\ O,\ SO_3 =} \\ \mathrm{Ba\ O,\ SO_3;\ Mn\ O_2;\ NO_4;} \end{gathered}$$

That is, we have formed peroxide of manganese and nitrous acid. But these reactions when the elements, at the temperature mentioned, are in contact with the oil itself, issue in other and more complicated changes, leaving in the oil, finally, sulphate of baryta and sesquioxide of manganese, and leaving the oil itself of a permanent deep brown colour, and with some increased drying properties. But as the process involves the using of the old and objectionable high temperature, and the final colour is also the old one, it is mentioned here only as an example, but which as a process is in every way inferior in value to these other methods.

THE GREAT BELL AND CLOCK FOR THE HOUSES OF PARLIAMENT.

Mr. Loseby's letter of the 10th inst., in reference to this subject, having been communicated to the *Journal*, it has been thought desirable in publishing it to reprint Mr. Loseby's first letter and Mr. Denison's reply, which have appeared in other papers.

SIR,—Notwithstanding the appearance of a leading article in the *Times* of Nov. 7, to the effect that a distinguished lawyer, Mr. E. B. Denison, Q.C., had, fortunately for mankind, been specially raised up by Providence to restore the art of bell-founding, and discover improvements in turret clocks, there are a few simple matters of fact which require to be brought forward, or the public may find, when too late, how little the anticipations so modestly announced in the *Times* have been realised.

In the first place, the chief fact, that the bell is intended for the clock, and will be struck by the clock hammer, and not by an immense clapper, appears to have been thrust into the back-ground; for we were told, several weeks ago, that the bell had been tried with a clapper of 700lbs., impelled by the force of five or six men, who had failed to bring out the full tone; and we are now informed that a clapper of 1,600lbs. is being prepared for the purpose; and the same notices lead us to understand that the official trial of the bell will be decided by this enormously disproportionate clapper instead of by the clock hammer, with which it will have to be used.

On looking over the different parliamentary returns on the subject, to ascertain the size of the clock, I find it is sufficiently large to lift a hammer of 120lbs., and give it a fall of six inches, with the clock going eight days; and it is further stated, that this proportion of weight and fall will be amply sufficient to bring out the tone of the large bell, provided it is of an average quality. Indeed, instances are mentioned in which the proportions are much smaller, as it is stated that the great bell of Oxford, weighing 152 cwt., only requires to be struck by a hammer of 54lbs., falling 4½ inches.

From the same returns we gather that the bell is to be supplied by the contractors, subject to the approval of competent referees on the part of the government, who will be deputed to ascertain if its merits are of the highest order, and if they are not, the bell is to be rejected. It is difficult to collect from the returns who the referees are at the present moment. At one time Mr. Denison and a gentleman nominated by him were appointed to the office, and more recently the duty appears to have devolved on Sir Charles Barry and Professor Wheatstone, but as other changes may have occurred, by which the responsibility no longer rests with the latter gentlemen, I think it better to make the following suggestions through the press, lest in the number of changes the duty of the referee should fall to the ground and be reduced to a dead letter.

1. That the bell, before being accepted, should be placed in the position it is to occupy in the tower, and then tried with a hammer of about 120lbs., falling, by its own gravity alone, through a space of 6 inches; and as this is the force which will be employed upon the bell when in use, it is obviously that which should be employed in all the experiments that are to determine its fitness for the purpose it is intended for, and any effect which may be produced on the bell by a clapper of 1,600lbs. urged by the force of eight or nine men through a space equal to the whole width of the mouth, should be regarded as altogether beside the principal question.

2. That if the quality of the tone proves satisfactory, the referees should proceed to note its volume by stationing themselves at different distances from the tower in and about the neighbourhood of London, in order to compare the quantity of sound produced by this and other known bells; due allowance being made for the difference of size, the direction of the wind, and the state of the atmosphere, &c.

3. That as the bell has being designed by Mr. Denison, if it should so fall out that he and his friend at present occupy the position of referees, it would afford more scope for impartiality in the judgment about to be pronounced if Mr. Denison, and perhaps his friend also, were to retire from the office, and leave the task of deciding on the merits of his work in other hands, particularly as this is the first public instance in which Mr. Denison's views on the subject have been brought to the test of practice, and the referees are to determine whether the bell shall be purchased by the government or not.

E. T. LOSEBY.

London Nov. 12, 1856.

Sir,—Mr. Loseby's statement, that it appears from the parliamentary papers that the Westminster clock is calculated to strike the bell with a hammer of only 120 lbs. raised 6 inches, is a pure and simple fabrication of his own, as anybody may see who will take the trouble to look at the contract, which was printed in 1852, and again in 1855. And any body who chooses to look at my latest book "On Clockmaking" (not the rudimentary treatise, but a reprint of the article in the "Encyclopædia Britannica," sold at Dent's, in the Strand), will see that a hammer of 4 cwt. falling 12 inches—nearly eight times Mr. Loseby's figures—was the least that I contemplated in designing the clock. The hammer will in fact be considerably more than this, as the bell is not only heavier, but much stronger than I ventured to expect three years ago.

I have been wondering what could suggest to Mr. Loseby such an absurdity as the striking of a bell of 16 tons with a hammer of 120 lbs.; and perhaps this is the explanation:—It does appear, from the parliamentary papers he refers to, that—not before, but—after the intended weight of the bell had been increased from that of the Oxford bell to 14 tons, a hammer of little more than Mr. Loseby's size was proposed, in that very plan for the clock which his fraternity, the Worshipful Company of Clockmakers, memorialised the Commissioners of Works to adopt, and to rescind (if they could) Mr. Dent's contract to execute my plan. It is only charitable to suppose that, writing with an imperfect recollection of the papers, and animated by a natural and amiable desire to pay off some old scores respecting his chronometer grievances, Mr. Loseby has, with a curious felicity of blundering, transferred the folly of the company of clockmakers to my account.

E. B. DENISON.

Sir,—After partly divesting Mr. Denison's letter, published in the *Builder* of Dec. 6, of the peculiar tone and epithets which pervade it, the matter resolves itself into the following:—

First. That the proportions of weight and fall given in my communication, viz., 120 lbs. for the hammer, and 6 inches for its fall, are "fabrications" of my own, and not to be found in the parliamentary papers, unless I have, as Mr. Denison expresses it, "blunderingly transferred the folly of the company of clockmakers to his account." Second. That in designing the clock he made provision for its having to lift a hammer of 400 lbs., and give it a fall of 12 inches, and that evidence is to be found of his having long contemplated this as the least quantity of work which the clock would have to do, and further, that now the bell has been cast, he finds even this weight and fall of hammer will have to be considerably increased.

In reply to the first part, I have to state that, before writing the letter to which Mr. Denison refers, I carefully examined all the published parliamentary returns to the House of Commons, viz., No. 724, Session 1847; No. 257, Session 1848; No. 500, Ssssion 1852; and No. 436, Session 1855; and that I have since gone diligently through them again, and the result is that I have not found any inaccuracy or error whatever in my former statement. The weight of 120 lbs. and 6 inches fall, are neither "fabrications" of my own, nor were they quoted according to Mr. Denison's other suggestion, from the "blundering statements of the company of clockmakers," but were taken from a table given by the late Mr. Dent, at page 56, parliamentary return, No. 724 of 1847; and, let me add, that I purposely confined myself throughout the letter to the quantities and figures given by Messrs.

Dent and Denison themselves, thinking that the latter gentleman would not then question their accuracy.

In reply to the second part, I have to observe that I can find no mention throughout the whole of the returns, either from Mr. Denison or any one else, that a hammer of 400 lbs. falling 12 inches would probably be required for the bell, which it was understood, before the first return was published in 1847, was to weigh from 14 to 15 tons. Neither has any provision been made, by enlarging the clock, for the enormous, and still accumulating, increase of work which Mr. Denison, in order to get his bell purchased by the government, seems now disposed to throw upon it. The main striking-wheel remains at 3 feet diameter, and it has never been increased beyond this size in any of the plans of Messrs. Dent and Denison, from the date of the first return in 1847, to the last return in 1855, and at this date the clock had been made.

In justice to the late Mr. Vulliamy, I must remark that the plan for the clock which was sent in by him, and which Mr. Denison ridicules, under the title of the fraternity of clock-makers' plan, as being too small for the purpose, was larger than any of the plans proposed by Messrs. Dent and Denison, as the diameter of Mr. Vulliamy's main striking-wheel was 3 feet 7 inches. Nor is this the only advantage in durability which Mr. Vulliamy's plan exhibits over Mr. Denison's, for it had gun-metal wheels throughout, whilst the wheels in the clock that has been made are all of cast-iron, the commonest and cheapest material that could be used; nor is this all for which the public have to thank Mr. Denison, Q.C., for he has so managed matters that the government will have to pay as much for the clock as though it had been made of the more durable and costly material.

In conclusion, I again set forward the principal questions to be kept in view:—

1. What is the force which the clock now made is calculated to lift? To this, I reply, that, taking into consideration the size of the striking part, the time it should last, and the fact of the wheels being composed of cast-iron, 120lbs. for the hammer and 6 inches for its fall, is the greatest quantity of work which the clock should be allowed to do.

2. What is the force which a good bell of 16 tons should require? To this I reply that, taking the Oxford bell as the standard, which weighs 152 cwt., and is struck by a hammer of 54 lbs., falling 4½ inches, and considering that Mr. Denison's bell was to have been much superior to the average quality, a hammer of 120 lbs. falling 6 inches ought to be amply sufficient to bring out the tone.

E. T. LOSEBY.

London, Dec. 10, 1856.

NOTICE TO MEMBERS.

The Labourers' Friend Society has placed in the hands of the Secretary of the Society of Arts, 100 copies of a Report by their Honorary Architect, H. Roberts, Esq., on the late Brussels Congress for the Improvement of the Condition of the Labouring and Indigent Classes.

Mr. T. Twining, jun., has deposited a limited number of copies of the Catalogue of the Brussels Exhibition of Domestic Economy, and a printed list of books, pamphlets, and other documents bearing on the condition of the working-classes, which have been presented to the Society of Arts, and are arranged for reference in the Society's Library.

Copies may be had on application to the Secretary.

Home Correspondence.

BUILDING-TRADE PATTERN-BOOKS.

Sir,—Permit me to call the attention of such manufacturers as seek to bring the articles they produce under the notice of architects and others, by means of illustrated circulars and trade lists, to the waste of time, trouble, and therefore money, caused by the inadequacy for practical purposes of the information they generally supply.

Within these last few weeks I have received, as have, no doubt, very many others, in my profession, some half-dozen picture-books, many evidently got up at very considerable cost, and evidencing a most satisfactory progress in design and technical ingenuity.

Of this half-dozen, scarcely one gives any notion, either by scale or figuring, of the size and substance of the objects represented; prices are either not at all indicated, or, if indicated, are expressed so vaguely as to form no guide whatever to the real cost of the articles.

What an architect really requires, if these pattern-books are to be of any use to him, are the following conditions:—

1st. Each object (if in the least degree complicated) to be given in plan, section and elevation.

2nd. Each object to be drawn to scale, and the scale put upon each plate.

3rd. Each object to have its leading dimensions figured as well.

4th. The best mode of attachment of each object to adjoining work to be clearly shown.

5th. Such a concise description of each object to be given, as to enable the architect to define the same in his specification, without risk of confusion or mistake.

6th. The price of each object complete, as engraved, to be marked beneath or near to the engraving; any suggested variations, either of enrichment, or tending to simplification, to be also priced; and attention to be drawn to probable cost of fixing, painting, gilding, or any necessary process not included in the first price quoted.

Illustrated price lists of articles for the use of all persons connected with the building trades, prepared in accordance with the preceding conditions, become most valuable sources of reference to professional men; whereas, if only pretty picture books, they are just looked over, thrown on one side, and then either put upon the bookshelves, perhaps never to be taken down again for years, or, after lying about for a week or two, are thrown into the waste-paper basket, as of no use. On the other hand, in an architect's office, a well arranged pattern-book is constantly referred to, and articles are drawn and specified from it, of course to the benefit of the manufacturer. If an architect knows that Brown's No. 3, or Jones's 24, or Robinson's 102, are just the right size and style for Mr. Smith's house, which he has got to build, and will cost such an amount as he thinks Mr. Smith can afford to pay, he at once determines to introduce the aforesaid numbers 3, 24, or 102, although, very possibly, some other manufacturer may, at the very same time, be making better and handsomer articles at a lower price.

Let us suppose that, seduced by a pretty picture-book,, without scales or prices, the architect is tempted to write respecting some work he wants done, to the person who sent him the aforesaid picture-book. He receives a reply, giving him the particulars the pattern-book ought to have supplied, and from the manufacturer's note he learns that the article he supposed to be about 4 feet long is 6 feet 6 inches; and that what he expected would cost £5 will cost £7 10s. He then writes to know if size and price can be modified. The manufacturer says, in return, that any modification can be made; will the architect send a sketch? The architect makes his sketch, and the manufacturer finds that the alteration, although diminishing the quantity of material, will, through the additional labour, cost more than the original £7 10s. The architect does not think the article worth the money, and, in his client's interest, declines to purchase. Everyone has had his trouble for nothing, and discontent is, of course, the result. If even the article should be procurable at the architect's price, £5, the five shillings his commission will procure him in return for his own and his clerk's time wasted, offers no very great premium to future transactions with the sender of the pretty but foolish picture-book.

Pray, believe, Sir, that I am drawing no fanciful picture, but one of daily occurrence. My only inducement to sketch it has been my sincere belief that, in the rapid introduction into the building trade of improvements in the quality and technical treatment of old and new materials, lies the secret hope we can have of an ultimate escape from the enfeebling tradition in architecture to honourable and national originality. It seems to me that the organ of the Society of Arts, which does so much to foster, and, indeed, to generate all such improvements, should convey this hint, which I do not think it will prove unprofitable for those manufacturers whom it may concern to attend to.

I am, &c.,
M. DIGBY WYATT.

54, Guilford-street, Russell-square.

MEN AND MANUFACTURES.

Sir,—A friend has just put into my hand your number of the 21st of November, containing a paper on this subject, by Mr. W. Bridges Adams. The drift of it seems to be, that, in the opinion of Mr. Adams, we should do well, as a nation, and economically speaking, to transfer our cotton manufacture from the present cotton districts of Lancashire and Lanarkshire to the Nerbudda districts in India. In support of this opinion, Mr. Adams makes one or two assertions which, to me, are somewhat astonishing. And, as I am tolerably familiar with the Lancashire cotton district, and have for some years given close attention to the best statistical data hitherto available, touching the present and indicating the probable future condition of our increasing town-population, as well in that district as elsewhere, and I find my own conclusions widely at variance on some material points with those of Mr. Adams, I venture to ask of that gentleman, through you, a further elucidation of some parts of his argument.

The first assertion of which I desire to see some proof is the following:—"Lancashire cannot grow men and women, for if she ceased to import them, they would disappear in a few generations, *i.e.*, men and women fit for cotton-working." I have at hand the returns of the population of every county in Great Britain, at the date of each of the six censuses taken since (and including) 1801. If Mr. Adams will be so kind as to point out among these materials, or in the Irish censuses, such as they are, taken during the last fifty years, or in the Reports of the Emigration Commissioners, or, in short, in any public documents accessible to the public, the particular returns, or other evidence, on which this assertion is based, I shall feel, and be ready to acknowledge, a considerable obligation.

To put the question in the form least likely to be misunderstood, I would suggest that it be assumed that the cotton manufacture, as now carried on in Lancashire, were brought to a stand-still, not to increase or diminish,—and that Lancashire were called upon, with its present population, to maintain it at its present level for two or three generations, without importing men and women. This will avoid any question as to how far the importation hitherto going on has been required to meet the continuous expansion of the trade. And if Mr. Adams will state the process of induction by which, his facts being given, he elicited from them the conclusion I doubt the veracity of, he will confer an additional obligation.

Having hitherto been of opinion that the cost of capital and of labour were both lower (allowing for the effective value of the labour) in Lancashire than in any other cotton-manufacturing district out of Great Britain, I should be glad to learn on what grounds it is that (looking at the effective value of the labour) Mr. Adams assumes that labour applicable to the manufacture, as now carried on in Lancashire, could be had in India at one-fourth of the cost now paid in Lancashire, or at any cost materially less. Also, whether Mr. Adams has considered the cost of the capital, fixed and floating, requisite for investment in India, to carry out his scheme; and if so, on what ground he assumes, as he appears to do, that here there would be, if no advantage in, yet no obstacle to, the change he proposes.

I do not overlook the prophetic character of what Mr. Adams asserts; and I am quite aware that, the period of fulfilment being unfixed, I may have taken up, as of immediate and practical interest, what was not so intended. If this be so, a word from Mr. Adams may set me right, and not only me, but, if I am not mistaken, many others, to whom everything that affects the present or approaching condition of this great branch of our national industry has a deep interest.

I am, &c.,
J. T. DANSON.

Carnsdale Farm, Barnston Birkenhead.

Proceedings of Institutions.

Waterford.—At the Mechanics' Institute, on Wednesday evening, the 12th inst., the second course of lectures was commenced by George Barker, Esq., author of "The White Squall," "Mary Blane," and other musical compositions, who appears to have given great satisfaction to a large audience.

To Correspondents.

Errata.—At page 57, column 2, line 1, at bottom, and line 3 from bottom, for "could" read "should;" and line 6 from bottom, for through," read "though." At page 71, column 2, line 24, for "Miss," read Messrs."

MEETINGS FOR THE ENSUING WEEK.

Mon. Actuaries, 7.
London Institution, 7. Dr. Tyndall, "On the Nature and Phenomena of Light."
Tues. Royal Institution, 3. Professor Faraday, "On Attraction."
Wed. London Institution, 3. Professor Rymer Jones, "On Vivaria and their Inhabitants."
Fri. Archæological Inst., 4.

PATENT LAW AMENDMENT ACT.

APPLICATIONS FOR PATENTS AND PROTECTION ALLOWED.

[*From Gazette, December* 19*th*, 1856.]

Dated 27th October, 1856.

2518. John Fordred, Islington—Improvements in lamps, in apparatuses connected therewith, and in manufacturing certain liquids for the production of light. (Partly a communication.)

Dated 22nd November, 1856.

2772. William Kemble Hall, London—Improvements in machinery for cutting, punching, and shaping metals.

2779. William Edward Newton, 66, Chancery-lane—Certain improvements in railway carriages. (A communication.)

Dated 25th November, 1856.

2791. John Bond, Burnley, Lancashire—Improvements in machinery for counting and indicating the number of revolutions performed by rollers and shafts.

Dated 26th November, 1856.

2799. John Musgrave, jun., Globe Iron Works, Bolton-le-Moors—Improvements in the construction of cloth beams for beetles.

Dated 28th November, 1856.

2814. Peter Walker, Warrington—Improvements in brewing, and in the machinery or apparatus employed therein,

2816. Camille Auguste Tissot, 39, Rue de l'Echiquier, Paris—Improvements in the production of motive power, and in the apparatus connected therewith.

2818. Joseph M. Saunders, 16, Westmorland-street, Dublin—Improvements in cooking ranges.

2822. Michael Allen, 39, Cavendish-grove, Wandsworth-road—Improvements in the slide valves of steam engines.

Dated 29th November, 1856.

2824. Charles William Siemens, John-street, Adelphi—Improvements in fluid meters.

2826. William Johnson, 47, Lincoln's-inn fields—Improvements in projectiles. (A communication.)
2828. Laban Clarke Stuart, New York—Improvements in machinery for reducing fibres to pulp. (A communication.)
2830. Edwin Senior Atkinson, Knottingley, Yorkshire—An apparatus for condensing vapours, fumes, gases, and smoke arising from chemical and smelt works.
2832. Richard Harmer, 12, Princes-street, Spitalfields—Improvements in stereoscopic pictures.

Dated 1st December, 1856.

2834. Charles Henry Gilks, Union-row, Tower-hill—An improved stand for umbrellas for railway and other carriages.
2836. John Gedge, 4, Wellington-street South, Strand—Improvements in lubricating the journals of the axles of railway vehicles or other moving parts of machinery. (A communication.)
2838. John Coope Haddan, Cannon-row, Westminster—Improvements in pianofortes.
2842. George Julius Vertue, Northam, Southampton—An improvement in deodorising sewage waters and sewage matter, when lime is used.
2844. John Carter Ramsden, Bradford, Yorkshire—Improvements in apparatus for the mechanism of looms for weaving a certain class of plaids, checks, and fancy woven fabrics.
2846. Noel Monnier, Paris—Improvements in bridles and bits for stopping horses.

Dated 2nd December, 1856.

2848. Frederick Cornwall, Birmingham—Certain improvements in the construction of fire-places applicable for general purposes, whereby combustion is rendered more perfect and capable of regulation or controul, smoke thoroughly consumed, and the draught in open fire-places much increased.
2850. Richard Archibald Brooman, 166, Fleet-street—Improvements in pumps and in pumping. (A communication.)
2852. Richard Archibald Brooman, 166, Fleet-street—A chemical composition or agent to be employed in the dyeing of wools and woollens. (A communication.)
2854. Louis Dominique Girard, Paris—Certain improvements in hydraulic turbines.
2856. James Apperly, Dudbridge, Gloucestershire—An improved fabric applicable to the manufacture of feed cloths or aprons.
2858. Matthew Townsend, Leicester—Improvements in machinery for the manufacture of knitted fabrics.
2860. John Hall Brock Thwaites, Bristol—An improved screw bolt, or fastening, for ship building and other purposes.

Dated 3rd December, 1856.

2863. Philipp Kurten, Cologne, Prussia—Improvements in the manufacture of mottled soap and yellow soap.
2864. Frederick Albert Gatty, Accrington—Improvements in the construction of filters or drainers.
2865. Emory Rider, Cannon-street—Improvements in the manufacture or treatment of gutta percha, being improvements upon the invention secured to me by Letters Patent, dated the 20th day of July, 1852.
2867. Adam Bullough and William Bullough, Blackburn—Improvements in looms.
2868. Henry Genhart, Liège, Belgium—Improvements in fire-arms and ordnance, and of the cartridges or projectiles to be used therewith.
2869. Julien Denis, 14, Queenhithe—Improvements in apparatus for corking and uncorking bottles without leaving any air between the liquid and the cork. (A communication.)
2870. Joseph Deeley, Mile-end-road—Improvements in furnaces for smelting and melting.
2871. James Kinder Cheetham, Rochdale, Lancashire—Improvements in the application of photographic pictures to metal and other surfaces, and in rendering the same applicable as printing surfaces.
2872. William Edward Newton, 66, Chancery-lane—Improved processes for ornamenting metallic surfaces, and for producing surfaces in intaglio, or in relief, for printing purposes. (A communication.)

Dated 4th December, 1856.

2873. Aimé Lecocq, France—Improvements in hydraulic engines.
2874. James Apperly and William Clissold, Dudbridge, Gloucestershire—Improved machinery for preparing fibrous substances for spinning.
2875. Louis Bayer, Soho—An improved stuffing to be used in place of hair or other substances in which such articles are commonly employed.
2876. Isaac Livermore, 5, Shrubland-grove East, Queen's-road, Dalston—An improvement in waterproofing paper.
2877. Laban Clarke Stuart, New York—Improvements in drying sized paper. (A communication.)
2879. Daniel Barnard and David Lichtenstadt, 29, High-street, Whitechapel—Improvements in tanning.
2880. John Simon Holland, Woolwich—Improvements in the manufacture of iron, part of which is applicable to other purposes.
2881. William Henson, Buckingham-street, Caledonian-road, Islington, and Henry Palmer, Newman-street, Oxford-street—Improvements in sewing or stitching machines.
2882. Auguste Edouard Loradoux Bellford, 10, Bedford-street, Strand—Improvements in drying, burning, and cooling bricks, tiles, and other ceramic substances. (A communication.)
2883. Louis Joseph Frederic Margueritte, Paris—Improvements in treating materials to be used in manufacturing retorts, crucibles, bricks, and other kinds of earthenware.
2884. David Crawford, Glasgow—Improvements in washing, cleansing and preparing textile fabrics and materials.

Dated 5th December, 1856.

2885. Robert Davison and Joshua Crowther, Lansdowne Factories, Limerick—Improvements in machinery for winding yarns or thread on bobbins or pirns fixed on spindles driven by gear or cogged wheels, and for winding weft, for either hand or power looms.
2886. Henry Moore, New Windsor, Berks—A boot and shoe stud.
2887. William Klœn, Birmingham, and Daniel Jones, Liverpool—An improvement or improvements in photography.
2888. Thomas Earp, Newark—An improved cutting apparatus for reaping and mowing machines.
2889. Alexander Grant, Clement's-court—Improvements in shirts. (A communication.)
2890. Lodewyk Polak Kerdyk, Manchester—Certain improvements in machinery or apparatus for extracting colouring matters to be employed for the purposes of dyeing, or for other similar processes.
2891. William Clyburn, Lombard-street—Improved machinery for making butter.
2892. Heth Ogden and Henry Hibbert, Salford—Improvements applicable to colliery and locomotive engines for the purpose of arresting or retarding their motion at required intervals, and of indicating the amount of work done in relation to such intervals.

Dated 6th December, 1856.

2893. William Hooper and Joseph Fry, Mitcham, Surrey, and George Nasmyth, Bucklesbury—Improvements in springs for railway carriages, and for other purposes.
2895. William Stettinius Clarke, 133, High Holborn—Improvements in combined caldron and furnace for agricultural and other purposes. (A communication.)
2897. James Perry, Ballymoney, Antrim, Ireland—Improvements in the treatment, application, and use of mineral tar for the production of oleaginous and lubricating matter and fuel.
2899. John Horace Taylor, Bunhill-row, and Philip Marcus, Well-street—An improvement in irons for ironing.
2901. Stephen Randoll Smith, Bristol—Improvements in anchors.

Dated 8th December, 1856.

2905. Richard Eaton, 2, Sussex-terrace, New-road, Battersea—An improvement in the manufacture of springs when India rubber is used.
2907. James Bertram, Edinburgh—Improvements in steam engines.
2999. Benjamin Carless, Birmingham—An improved bird cage.
2911. Edward Burwell, Gainsborough, Lincoln—An improvement in roasters for coffee, cocoa, chicory, and similar substances.

Dated 9th December, 1856.

2913. Joseph Lillie, Manchester, and Arthur Dobson, Belfast—Improvements in machinery or apparatus to be used in the processes of drying animal, mineral, and vegetable substances.
2915. Thomas Vicars, sen., Thomas Vicars, jun., Thomas Ashmore, and James Smith, Liverpool—Improvements in the manufacture of biscuits, lozenges, and other like articles of confectionery.
2917. John Rawson, Bury—Improvements in lubricators.
2919. John Robinson Scartliff, Wolverhampton—Improvements in apparatus to be employed as an alarm and detector in cases of burglary.
2221. William Seggie Carr, New York—Improvements in water-closets.
2923. Hector Mollet, Newlay, near Leeds—An improvement in fulling woven woollen fabrics.
2925. John Thornett, jun., New North-road—Improvements in gas-burners.

INVENTION WITH COMPLETE SPECIFICATION FILED.

2933. Louis Vignat, 3, Place des Victoires, Paris—A new slide beater with one or more shuttles applicable to any loom whatever for weaving all kinds of tissue.—11th of December, 1856.

WEEKLY LIST OF PATENTS SEALED.

December 19th.

1774. John Macintosh.
1441. George Tillett.
1443. Francis Gybbon Spilsbury.
1445. Theodore Schwartz.
1453. James Bullough.
1456. Michael Thomas Crofton.
1462. Elias Robison Handcock.
1465. William Valentine Miller.
1470. James Atkinson Longridge.
1471. George Riley.
1472. John Miller.
1476. Charles Mills.
1479. John Saxby.
1481. Joseph Harrison and Christopher Gelderd.
1499. James and Richard Kenyon.
1511. William Hudson and Christopher Catlow.
1522. Bevan George Sloper.
1525. William McAdam.
1557. Thomas Emmanuel Marais.
1558. John Williamson and J. Cochran Stevenson.
1567. Joseph Brown.
1573. John Henry Johnson.
1577. Joseph Adshead.
1585. Robert Millward.
1593. Henry Smith.
1607. Robert Martineau and Brooke Smith.
1649. William Petrie.
1679. Adolphus Frederick Gurlt.
1725. John Edward Hodges.
1740. Samuel Frédéric Berthiez.
2477. Alfred Vincent Newton.

PATENTS ON WHICH THE THIRD YEAR'S STAMP DUTY HAS BEEN PAID.

December 16th.

2939. George Anderson.
2943. Isaac James.
3022. Alfred Vincent Newton.

December 17th.

2937. Joseph Sharp Bailey.

Journal of the Society of Arts.

FRIDAY, JANUARY 2, 1857.

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POSTAL ARRANGEMENTS.

The Postmaster-General, anxious to promote rapidity and correctness in the delivery of letters, has, for postal purposes, divided London and its environs into ten districts, each to be treated, in many respects, as a separate town; and, to render this arrangement effectual, he earnestly requests that every means may be taken by the public for causing letters to be directed *according to the district for which they are intended.* Initials will suffice.

The house of the Society of Arts being situate in the West Central district, letters on the business of the Society should be addressed thus:—

The Secretary of the Society of Arts,
Adelphi.
W. C.

or, when from the country thus:—

The Secretary of the Society of Arts,
Adelphi,
London.
W. C.

The Postmaster-General suggests other means of inducing this practice, that, when convenient, each resident in a district should add the name of the district, or the initials, to his own address inside his letters when writing to correspondents, and on his address card. Also, that if in business, he should give the name of the district, or the initials, in the heading of bills or invoices, in advertisements or placards, and on any article of manufacture which may bear his address.

If the initial letters be thus regularly appended, the Department will be able to assort, with facility and correctness, the country letters, according to their respective districts, before they reach London in the morning.

MICROSCOPIC OBJECTS.

Messrs. Parkes and Son, 5, St. Mary's-row, Birmingham, are prepared to supply microscopic objects suitable to the Society's prize microscope, at reduced rates, to members of the Society, and to Institutions and Schools in union, forming an "Educational Series."

The following preparations have just been completed, every object is numbered and named, and a descriptive essay accompanies each set:—

"Class A" is an introductory set, consisting of 24 preparations of various kinds, neatly fitted in a leather case, accompanied by a descriptive essay, entitled "Microscopic Revelations," 10s.

"Class B" consists of 24 insect preparations, in a leather case, accompanied by a popular description of the structure of insects, forming a practical introduction to the study of Entomology, 15s.

"Class C" contains an interesting and valuable series of 35 vegetable preparations, in a leather case, illustrating the Microscopic structure of plants, each object being numbered and described, so as to form a practical introduction to the study of Botany, £1.

Other series will probably be issued, comprising fossil infusoria and sponges, anatomical preparations, illustrations of adulterations in articles of food and commerce, &c., &c.

Anatomical injected preparations are to be had at 16s. per dozen.

Cheaply mounted objects for beginners, suitable for the smaller prize microscopes, are supplied at 1s. per dozen.

A discount upon these prices will be allowed to Members of the Society, and to Institutions and Schools in Union.

Messrs. Heylin, of 28, Paternoster-row, have been appointed Agents in London for the sale of these articles.

RATING OF INSTITUTIONS.

The following letter has just been sent to *all* the Literary and Scientific Societies and Mechanics' Institutions of the Kingdom, so far as they are known:—

RATING OF LITERARY AND SCIENTIFIC SOCIETIES AND MECHANICS' INSTITUTIONS.

Society for the Encouragement of Arts, Manufactures, and Commerce, Adelphi, London, Dec. 29, 1856.

Sir,—In the course of last Session a bill, prepared under the direction of the Society of Arts, for amending the Act 6 and 7 Vict., c. 36, to exempt from local rates Land and Buildings occupied by Scientific and Literary Institutions, was brought into the House of Commons by Mr. Ewart, Mr. Hutt, and Lord Stanley, Vice-Presidents of this Society. The bill, having in the face of a strong opposition passed the second reading, was dropped, owing to the late period of the Session.

In the coming Session of Parliament this bill will be reintroduced, with such amendments as the experience of the last Session and the suggestions of the Institutions will enable the Council of this Society to supply.

The subject having for some time been under the consideration of the Council of this Society, the following Minute was passed at a meeting of that body held on the 17th inst., and I am instructed to invite your attention to it:—

"The Council having taken into its consideration the present unsatisfactory position, with regard to the rating of Mechanics' Institutions and other like public bodies engaged in the advancement of education, as also the present indefinite state of the law as enacted in the 6 and 7 Vict., cap. 36, do hereby resolve that petitions under seal from the Corporation of this Society, shall be presented to both Houses of Parliament early in the ensuing Session, praying that Mechanics' Institutions and other like public Societies established for the promotion of education and the advancement of knowledge, shall be exempted from the payment of rates.

"That to enable the Society to present a strong case for the favourable consideration of the Legislature, it is necessary that the Council should be in a position to state with accuracy the names of all the Mechanics' Institutions and other like Societies now in operation, the present number of members belonging to each, the number of volumes in their reading-rooms, the average number of lectures annually given, whether there are classes for day and evening instruction, in what subjects, and the average number of pupils attending each class."

In accordance with the foregoing Minute, I am directed to request the favour of your furnishing me with the necessary particulars (see form on the following page), to enable this Society to include your Institution in the tabular returns it is proposed to lay before Parliament, and to establish a general system of united action, with a view to induce the Legislature to encourage the multiplication and development of Institutions, which, rightly conducted, tend so powerfully to amend the social condition of the people.

I am further instructed to add that, should you desire to be supplied with suitable forms of petition to the Houses of Parliament, to be presented by those members of the Legislature who are locally connected with your Institution or neighbourhood, I shall transmit the same to you on your returning to me the annexed form duly filled up. I am, Sir, your obedient servant,

P. LE NEVE FOSTER, *Secretary.*

⁂ Should there be any Institution or Scientific Society in your neighbourhood to which a copy of this circular may have been omitted to be sent, on your forwarding to me a note of the name and post town, a copy shall be transmitted.

The following is the form of return required, and if any Institution has not received a copy, it will be supplied on application:—

(Return Paper.)

Name of Institution (in full)____________________

Post town ____________________

When was the above Institution founded?	
What is the present or average number of *paying* members in your Institution?	
What is the number of volumes in your reading-room or library?	
Are lectures given in your Institution? If so, what number was delivered last year?	
Are there day or evening classes in your Institution? If so, in what subjects, and what is the average number of persons attending each class?	
What is the average annual income of your Institution?	
Is your building rented, or is it the proderty of your Institution?	
Are there any suggestions which your Managers would desire to make with respect to the provisions which should be introduced into the Bill now in course of preparation by the standing Counsel of this Society? If so, please to transmit them with this form.	
Do you desire draft forms of petitions to parliament to be forwarded to you to be presented by your local members?	

This form is requested to be returned not later than the 19th of January, 1857.

ECONOMIC LIBRARY.

It is desired to form, in the Library of the Society of Arts, a special collection of English and Foreign publications, relating to the condition of the Working Classes, and the means for improving it.

This collection will particularly include the programme and annual reports of the various Provident and Benevolent Institutions in the metropolis and the provinces, and other minor publications, which are frequently required for reference by persons practically engaged in promoting the improvement of the physical and social condition of the people; but which, from their inconspicuous appearance, are not generally classed among the available contents of a public library.

As the plan can only be carried out to full advantage by extensive co-operation, persons who can supply or obtain through their friends publications or documents of the nature pointed out in the following summary, are invited to forward them to the Secretary.

N.B. The following indications are not to be considered as exclusive. Other subjects will suggest themselves by analogy.

I. Programmes, Regulations, Annual Reports, &c., showing the organization of, and results obtained by, the various Institutions established for the benefit of the Industrious Classes, such as Model Dwellings, Dormitories, Sailors' and Servants' Homes, Baths and Washhouses, Soup Kitchens, Working Men's Coffee Rooms, *Fourneaux Economiques*, Dispensaries, Hospitals, Asylums, Eleemosynary Institutions, Reformatories, Schools for the Blind, Deaf, and Dumb, *Crèches*, or Public Nurseries and Infant Schools, Ragged Schools, Industrial Schools, Evening Classes, Mechanics' Institutions of every kind, Village Libraries, Clothing and Provision Societies, Friendly Societies and Benefit Clubs, Savings Banks, Pawn Houses (*Monts de Piété*), Trades Associations, Land and Building Societies, Allotment Societies, Societies for the Protection and Guidance of Emigrants, Societies for the Patronage of Apprentices.

As it is the evident interest of the foregoing Institutions to become more extensively known, it is hoped that their Secretaries will be disposed to favour the Society of Arts with their respective papers.

II. Publications and documents relating to the Domestic Economy of the Working Classes, including Building Designs and Materials, Fittings, Furniture and Household Utensils, Clothing, Food, its production, commercial supply, preparation, adulteration, &c.; Fuel, and other domestic requisites.

III. Publications and documents relating to various departments of Sanatory Economy, such as Drainage, Sewerage, Water Supply, Ventilation, Removal of Nuisances, Prevention of Casualties by Inundations, Shipwreck, Fire, &c.; Protection against the effects of Hot, Cold, Dry, Damp, or changeable Climates; Prevention or Relief of the Accidents, Injuries, and Diseases which attach to many handicraft occupations; Organization of Medical Assistance.

IV. Essays and other Publications relating to the Social Condition of the Industrious Classes; the relations of Employers and the Employed; the Organization of Labour, &c.

V. Acts of Parliament, Official Reports, Statistical Returns, &c., bearing on the before-mentioned subjects.

VI. Manuals and Hand-books for Special Classes or Trades.

VII. Publications describing or illustrating the condition of the Working Classes in the Colonies or in Foreign Countries.

VIII. Periodicals intended for the use of the Working Population or their friends.

Further indications will be found in a printed list of papers already presented to the Society of Arts, of which copies may be had on application to the Secretary.

In absence of the publications themselves, particulars of them, and of the address where they may be obtained, will be thankfully received.

It is contemplated to form a classified list of all that has appeared in print within these last five or six years, of a nature to interest the friends of the Working Classes, and to continue this catalogue from year to year.

It was agreed at the International Congress lately held at Brussels, that each country should forward such a list once or twice a year to a Central Committee at that place, in order that the whole might be published as an International Bulletin.

The Right Hon. W. Cowper, M.P., President of the Board of Health, and Mr. T. Twining, jun., one of the Vice-Presidents of the Society of Arts, were requested to undertake the correspondence with the Central Committee on behalf of England, and they will gladly avail themselves of the assistance of persons taking a special interest in any department of Social Economy or Practical Benevolence.

A list of French publications, which may prove valuable to the friends of the working classes in this country, has been published in the *Annales de la Charité*, and may be referred to in the Society's Collection.

UNITED ASSOCIATION OF SCHOOLMASTERS.

The Third Annual Meeting of this body was held in the room of the Society of Arts, by permission of the Council.

The Rev. Dr. BOOTH, F.R.S., Treasurer of the Society of Arts, delivered the inaugural address, which was as follows:—

On the invitation of your president and committee, now two successive years conveyed to me, I appear here before you this evening to handle questions of the highest interest to all classes, but in an especial manner such to you. I will not enter into details of school management, or argue questions of school discipline, matters in which I should hardly venture to advise you, much less presume to dictate to you. I will rather use the short time placed at my disposal to enlarge upon topics of more general interest and more pressing importance.

I may, however, be permitted to make this one observation—that it should be your object to implant principles, and not to follow the example of those who waste their pupils' time over mere matters of detail. How often do we see boys' minds loaded with dry statistical facts, and tabular results, which are but of little value, unless strictly accurate, which can never long be retained so, and which always can be had in some handy book of reference when required. A lad might as well be set to get by heart a table of logarithms, as some of the statistical information he is required to commit to memory. When one has mastered the few broad principles which constitute the foundations of a science, he will be in a position, if he has but energy and perseverance, to build up, so to speak, with his own hands the edifice itself, instead of looking on with the vague notions of a spectator, and seeing the work done by others. Rules are but the last results of a profound knowledge of the principles, whether of a language or a science. To start with committing rules to memory, instead of developing principles by the understanding, is to invert the order of nature, who first teaches the language by the ear, or informs us through the senses of those common facts, in the sagacious appreciation of whose value every experimental science has more or less originated. Thus the greatest linguists, such as Murray, Magliabechi, first learned a language by nature's process, and then educed its rules. Galvani, or rather Volta, developed the laws of that mysterious science, galvanism, setting out from a fact, which, or some one cognate to it, must have been observed before. The electric telegraph owes its invention to an observation made by Œrsted, the Swede—but I stop short—I might occupy the whole of my time in illustrations of this kind.

It has often been objected to the friends of education and progress in our own time that they do not retain that traditional reverence for antiquity, that veneration for great names, which distinguished the promoters of intellectual advancement at the birth of modern civilisation, that we no longer feel that exclusive admiration for the literature and science of Greece and Rome, which, three centuries ago, was a marked characteristic of everyone who professed to cultivate either literature or science. Now, this veneration for ancient wisdom is founded on an erroneous comparison. The young naturally confide in the experience and knowledge of the old; and as the old have preceded them in point of time, we are led by the seeming analogy to look upon the early period of the world as its old age instead of its youth. Lord Bacon, in his "Advancement of Learning," says, "Certainly, our times are the ancient times when the world is now ancient, and not those which we count ancient, *ordine retrogrado*, by a computation backward from our own times." Again, an exaggerated admiration of antiquity, and a sort of longing regret for times passed away, are by no means hopeful signs of a present healthy progress. It has sometimes been remarked of those who have descended from a long line of ancestors, and degenerated in the descent, that they were satisfied to place their claims to consideration, not on the grounds of personal merit, but on the greatness of those who have gone before them. The same is as true of nations as of individuals. Mitford, in his "History of Greece," if I rightly recollect, somewhere observes, that Diodorus and Plutarch, by their extravagant eulogies on the extinct republics and legendary heroes of antiquity, tried to console themselves for the degeneracy of the times in which they wrote; that by their enthusiastic admiration of forms of government that had been abolished, they indirectly censured the enormities of the grinding despotisms under which they scarcely could call even their lives their own, and that the tone in which they lauded the liberties they had lost was the surest index of the slavery under which they groaned. The same tone of saddened retrospection pervades the fine preface of Livy's immortal history.

But, independently of these considerations, there is a legitimate cause for this admiration of antiquity, and you will bear with me while I develop it at some length. Let us in imagination go back to the year 1500 of our era, or thereabouts; let us suppose a man somewhere in the South of Europe, or on the coast of Western Asia, within sight of that purple sea, beyond whose sunny shores civilisation had never yet been able to advance. Let us further suppose him to be profoundly versed in all human learning, and acquainted with every cardinal event in man's history. What, let me ask, are the reflections that would naturally arise in the mind of so accomplished and philosophical a spectator taking a comprehensive view of the annals of mankind, and of the progress of civilisation, from its earliest recorded dawn down to his own time? He would have seen all human knowledge either absolutely stationary or actually retrograding. He would have seen that the science of his own day had not made a single step in advance during the long period of 1,700 years, from the state it was left in by Archimedes and Euclid and Apolonius; that the science of medicine had dwindled down into a mere empirical art since the days of Hippocrates and Galen; that there was no body of laws worthy of the name but the Roman code; that alchemy flourished, for chemistry was not yet; that astrology had displaced the little astronomy that was known; that there was absolutely no such thing as physical science; that the multitudinous facts of natural history had yet to be observed and noted. That in poetry, oratory, architecture, and the kindred arts of painting and sculpture, the ancients transcended rivalry or even successful imitation. In short, that the whole sum of human knowledge, scant as it was, had continued absolutely without sensible augmentation during 18 long centuries of man's eventful history. That the acutest wits and the most subtle intellects, were forced to move round and round in the same dull circle, and thresh the straw that had been threshed a thousand times before. That the profoundest genius failed to make even the shallowest discovery either in art or science; that the most learned men occupied themselves century after century in piling up pyramids of commentaries on those wondrous men, Plato and Aristotle, who, like the Pillars of Hercules in the old mythology, separated the clear, the definite, the settled, and the known, from the dark, the vague, the boundless, and the obscure. When, moreover, our supposed inquirer, continuing his survey, would have learned that whole regions of the earth's surface were passing clean out of the knowledge of civilized man; that the ideas which learned professors and adventurous travellers formed about countries not far remote, were vague and contradictory; that less was known four centuries ago about the geography of the world than in the time of Herodotus, Strabo, Ptolemy, or even Agatharchides; that many inventions and curious processes in the arts had actually perished, and which have never to this day been rediscovered. When, moreover, looking to the political aspect of the world, he would have seen the very fairest and most hallowed regions of the earth's surface overrun by the wild fanatics of Arabia, and trodden down by the barbarian hordes of Turkistan, who, with wide unbroken front, were advancing like the ocean tide rushing up the narrow estuary, to overwhelm, in one undistinguishing flood, all that had remained of the ancient civilisation; and when, lastly, it is recollected that to such an ideal spectator, contemplating the history of man's progress upon earth, that great renovating institution, the Church, would have presented herself, not as the living breathing incarnation of the Gospel, giving health and vigour to the worn out and used up nations of antiquity, but, like Niobe of old, petrified into stone, and become herself a huge stumbling-block in the way of progress—a rock of offence to those who saw not that her corruptions and errors were in some measure at least due to the trying times through which she had to pass.

From such a retrospect of the past, one could scarcely draw, with regard to the future, other than the most desponding conjectures. Men could scarcely foresee that as the night is darkest before the dawn, so out of this dense moral night and darkness of the human understanding a new order of things was soon to arise, and the light of a higher and better civilisation to gladden our humanity. It is no wonder that men, looking back through the long vista of time, and seeing that all that was worth preserving in literature, art, and science—whether it be poetry, oratory, or the drama—whether it be architecture, sculpture, or painting, was the creation of comparatively a small number of gifted men, and the birth of a few remote centuries, it is no wonder, I repeat, that men in those days had come to the conviction that nearly every thing that could be known was already known. In fact they had a special name for it. They called it the "omne scibile." They called it not "omne scitum," but "omne scibile," not merely every thing that was known, but that could be known. It is not strange that for those who had at once touched the limits, and reached the very outer verge of human knowledge, a feeling of admiration apparently akin to hero-worship, should have been felt, as being the greatest benefactors of mankind.

Let us now shift our standing point to the present time, and view the wonderful change produced in the aspect of human advancement. I will not dwell upon the multitudinous discoveries in natural knowledge, the glory of our age, because they are familiar to most of you, but I will take the science of pure space or geometry as an example of this progress, and the rather as this science is the creation of the pure intellect depending neither on experiment nor observation, the great instruments of modern discovery. Within the last forty years mathematical science has received a far greater development than in the entire period that intervened between Archimedes and Newton. Such has been the fertility of methods of research recently invented, that while formerly the discovery of a new theorem was enough to render a man's name illustrious, now they may as easily be found, and with as little trouble, as nuggets of gold on the other side of the globe. It is not, therefore, strange that amidst the crowd and brilliancy of modern discoveries, those which have been so long before the world should somewhat pale their brightness.

Before I pass from the consideration of this, the second birth of human knowledge, far more prolific than the first, there is a remark I would desire to make, and it is one of great interest. It is this, that all our discoveries, wherever made, in whatever art or science, all tend to the advantage of the masses, as contrasted with the great ones of the earth. Books, that once were in the hands of nobles and prelates only, sometimes worth even a king's ransom, are now, thanks to the art of printing, within the reach of the poorest of the community. Libraries existed before the days of Caxton—the newspaper and the reading-room are of a subsequent date. Again, consider how much human labour has been relieved by the application of gunpowder in great engineering and mining operations. Who shall compute the amount of human toil which a knowledge of the power of this agent would have saved in the piling up of the Pyramids of Egypt, in excavating the Temples of Ellora, or in cutting out the Sculptured Shrines of Elephanta? How much suffering of the masses would a little of this chemical science have averted in the building of the Roman aqueducts, which a scientific appreciation of the simplest law of the equilibrium of fluids, now known to every schoolboy, would have shown to be superfluous. Need I do more than allude to steam, or to the steam-engine—that great modern Cyclops—or to the improvement and cheapening of iron, that most valuable of all the metals, or to the innumerable inventions in machinery, bearing on the cheap manufacture of textile fabrics, or to the application of mechanics and chemistry to agriculture? Only consider the facilities afforded to the poor man of conveying his labour, his only capital, to the uttermost parts of the earth by steam navigation and railway locomotion. The great in every age could travel luxuriously if not expeditiously, but now the artisan can travel with as much personal comfort as the gentleman could 30 years ago. Suetonius, speaking of Augustus, says, "He was borne along by slaves, and the gentle motion allowed him to read, write, and employ himself as in his cabinet. Though Tivoli is only 16 miles from the city, he was always two nights on the road." Well, then, to bear out my argument, there is gas more brilliant than wax-light and cheaper than the tallow dip. Electroplating and photography bring the finest models and the most truthful landscapes within the reach, if not of the labourer, at least of the mechanic. While, on the other hand, but little advancement is to be found in those things which minister exclusively to the luxury of the rich. Marble must still, as two thousand years ago, be the material which, so to speak, encrusts the breathing statue. Oil and canvass still supply the material elements of our finest paintings. Pearls have not diminished in value or improved in lustre since Cleopatra dissolved them in the wine-cups of her guests to show the extravagance of her magnificence. Science has revealed to us the analysis of the diamond, but art has not yet discovered the synthesis of this precious bauble. So that the ruby and the diamond, the sapphire and the emerald, still continue as untractable and as unchanged, as brilliant and as costly, as when they constituted, in the vision of St. John, the foundations of that new and holy city which had no need of sun or moon, and neither light nor temple werethere.

This is, indeed, a very remarkable and striking characteristic of nearly all our great modern discoveries, that they tend to create or to cheapen, if already in existence, those things which improve the condition or tend to promote the welfare of the masses of mankind. Other discoveries, too, tend in the same direction. It is only a few days ago that in this room the intrepid and indefatigable explorer, Dr. Livingston, gave us an account of regions never hitherto trodden by European foot. He has opened up to us the only *terra incognita* which remained on the surface of the globe, if we except some portions in the interior of Australia, which are even now, while I speak, opening up their arid steppes and barren plains to British science, energy, and enterprise. And here let me further strengthen my argument by referring to the mighty influences which at this very time are being inaugurated by the operation of that mysterious agent of civilisation, the electric telegraph. Is not truth strange, stranger than fiction, when we are told that in this room we may have intelligence in a shorter interval of time from Constantinople or the Pyramids than from Primrose-hill. Why, the electric telegraph endows mankind with a sixth sense, and the fable of Lynceus becomes a tame and vapid story. Let me add further yet, that *foci* of the language in which I now address you are being established all over the globe, whence in ages yet to come will radiate the language of Shakspere and Milton, of Newton and Bacon, of Butler and Locke, and above all, the pure well of English undefiled, our standard translation of the Bible. The whole vast continent of North America, with the chief islands of the Carib Sea, speaks the English tongue. In South Africa it is heard. Livingston has carried it into the remotest recesses of that least-known of continents. In the vast regions of India it is the dominant language from Cape Comorin to Cashmere; the vast continent of Australia speaks no other; it resounds along the coasts of China, and like a watchword echoes from island to island in the great South Sea.

Surely the cumulative force of all these arguments and considerations which I have placed before you give irresistible weight to this conclusion, and I cannot express it so happily as in the words of the Royal President of the Society in whose house we are met this evening, who, in his address at the Mansion-house to the mayors of the principal towns of the United Kingdom, is reported to have said:—"Nobody, however, who has paid any attention to the peculiar features of our present era will doubt for a moment that we are living at a period of most wonderful transition, which tends rapidly to accomplish that great end to which indeed all history points; the realisation of the unity of mankind! Not a unity which breaks down the limits, and levels the peculiar characteristics of the different nations of the earth, but rather a unity, the result and product of those very national varieties and antagonistic qualities. The distances which separated the different nations and parts of the globe are rapidly vanishing before the achievements of modern invention, and we can traverse them with incredible ease; the languages of all nations are known, and their acquirement placed within the reach of everybody; thought is communicated with the rapidity and even by the power of lightning."

In direct antagonism to this pervading principle of modern discovery—the benefit of the masses—to which I have just now directed your attention, is a custom which has grown up quite recently, and which would not have become a custom had the practice not been abetted by wealthy amateurs and selfish collectors. It is the most signal instance of modern Vandalism on record, and deserving of your deepest reprobation. I refer to the barbarous practice of plate-destroying to enhance the value of the impressions already taken. The wealthy collector is not satisfied with his proof impression of a plate before letters, unless he is assured that his poorer neighbour shall never enjoy even a ten thousandth impression of it. No humble Englishman is to be permitted to point out to his eager children how here an uncle fell on the plain of Balaklava, or how there a brother died for England on the heights of Inkerman, lest forsooth some retired pawnbroker should be shocked with the intelligence that some mechanic or other low person in the village had an engraving pinned up against the wall, just the very ditto of the one in the gilt frame hung up in the drawing-room. Now, what should we say if a few wealthy book collectors had proposed to enter into an agreement with our illustrious historian that no second edition of his great work should be published, and only a limited number of the first, so that Macaulay's "History of England" might be shown to the curious behind a screen or in a glass case? Such a proposal would kindle an universal indignation, yet how does it differ in principle from the case of Vandalism I have brought under your notice? Of the genuine aristocracy of this country, I will say this, they exhibit but little of that contemptible feeling. Their galleries are thrown open to or are accessible to the public. They freely lend their most valuable pictures for exhibitions, as just now at Manchester. They allow them willingly to be copied. How often do we see a like churlish feeling exemplified, when some old castle or baronial mansion, approached through huge branching oaks, those grand old trees, through shady dells and living walls of verdure, passes into the hands of some retired stockbroker or other millionaire? The crumbling fence or ragged hedge, which beyond man's memory let the poor wayfarer, or the tired traveller, or the sketching tourist, contemplate God's beauties in the calm and quiet scene spread out before him, soon gives place to the smug brick wall, bristling with broken glass, and threatening notices to all would-be trespassers.

In the observations I have the privilege to address to you from this place, I may be permitted to assume that you are the representives, at least for the present, of that numerous, useful, and important body, the educators of the youth of England. What this country shall be some 20 or 30 years hence, you have no small influence in determining. You are the connecting link between the present and the future. On a recent occasion I endeavoured to show, what may have seemed strange to some, that learning the elements of knowledge depends rather on the moral than on the intellectual nature of man—that it is rather a question of energy, of perseverance, of determined will, than of fine intellect or of original genius. It is told of some old Greek philosopher—I forget just now of whom—that when he was asked what was the best education for boys, replied, "That which will best fit them to discharge their duties as men." This is a great truth which ought never to be lost sight of. When this is practically forgotten, you ignore the very essence of education, which is to "educe," to "draw out" the faculties, as it were, for future use, and to "instruct," that is, to furnish the faculties so drawn out with available and useful knowledge. Remember, you are educating boys, who, when they leave you, are not to become pleaders in the law courts of ancient Athens, or candidates for office in the Forum of republican Rome. No: but it may be their lot in far distant regions of the globe, in the face of difficulties and dangers, under trials and temptations, to uphold the great name of their native country—to show that as she is first in arms, she is second to none in arts—that while they carry with them the instruments of civilisation, and the truths of science beyond the reach of barbarous tribes to understand, or if understood, to appreciate, they have not left behind them those qualities of justice, fair dealing, integrity and truth, which are instinctively patent to the whole human race. "One touch of nature makes the whole world kin."

To you a great trust is confided. On the character of a lad which has received its impress from you, may some few years hence depend the weal or woe of thousands. The boy who on one of your forms has learned to rule himself, may undergo that discipline which will qualify him to govern a subject nation. This is no impossible contingency, when you consider that the whole of the civil appointments, hitherto in the gift of the East India Company, have been by Act of Parliament thrown open to the widest and most unreserved competition. Bear in mind that you are not educating Italians or Poles, men whose education would have little influence either for good or evil beyond themselves; but you are training up the great pioneers of civilisation, the men to whom under Providence it may be given to realise the community of nations.

Again, if you consider education with reference to its bearings on the welfare of our own country and the security of its institutions, you cannot but agree with me that the stability of everything we hold dear is based on the intelligent loyalty of our people, as this latter alone depends on their right education. What the people of this country will to be done, be it for good or evil, must be done. Need I refer to the Reform Bill, or to the repeal of the corn laws, or to the Russian war, all of which were carried through by the people themselves in despite of the most strenuous opposition. Louis XIV. used to say, "I am the State." The middle classes now with much greater truth may say, "We are the State," for when united on any question that question must be carried. They are, therefore, the depositaries of that despotic, absolute, irresponsible power which in every independent state must of necessity exist somewhere. Now, is it not a matter of the very highest importance that these classes should be instructed in their duties, that they should be taught how freedom, as it is the birthright of every Saxon, so is it in our day the exclusive possession of Englishmen and their descendants.

They should learn how other nations, too, once were free, but lost their freedom, because they abused it, and did not know how to enjoy it. They should be shown how much wiser and safer is it to repair and restore than to pull down and demolish. They should be made to understand how a state of progress, how the condition of development is just as natural to the growth of society as it is to any other growth, whether animal or vegetable; how internal change may be consistent with the most perfect security, and promote the welfare of its members, just as the oscillations of the ocean, while they do not affect its mean stability, are the condition of life for all within its bosom. Teaching these principles of political action, you will breathe life into them by showing how they flow from the letter and the spirit of that Great Charter of human freedom, wrested from no earthly prince, but the free gift of the Eternal King; you know how he, who was himself a Roman citizen, disdained not to acknowledge as a brother Onesimus the slave.

I have now endeavoured to prove the importance of education, whether we look abroad or at home, whether we regard it as the true safeguard of our political and religious liberties, or as the means of making known to the many those truths brought to light by the unwearied labours of the profoundest intellects among men. It is a signal test of the reality and rapidity of our progress, and the remark is due to Dugald Stewart, that "the discoveries which in one age were confined to the studious and enlightened few, become in the next the established creed of the learned, and in the third form part of the elementary principles of education. Among those who enjoy the advantages of early instruction, some of the most remote and wonderful conclusions of human reason are even in infancy as completely familiarised to the mind as the most obvious phenomena which the material world exhibits to their senses." It is, therefore, your duty to cultivate by every means in your power that love of knowledge, which is inherent in the human breast, though but too often dulled by the allurements of pleasure and indolence; you must, therefore, rouse a spirit of perseverance, energy, and self-reliance to come to your aid. To encourage the development of these moral qualities I know no means so effectual as competitive examination, now become so general, and now being carried into effect by the Society of Arts, for the benefit of the large number of Mechanics' Institutions and schools in union with it. I need not here enter into the details of this plan, which must be familiar to most of you, and is accessible to all. It was only this morning I read a review in the *Times* of Mr. Meadows's work on China. That gentleman, whom the reviewer admits to be qualified above all his predecessors to pronounce a just opinion on China, asserts it as his conviction that the stability, peace, and prosperity of that immense region, with its 300 millions of inhabitants, is due to the system of competitive examinations. Mr. Meadows maintains that "in every case the institution of public service examinations, which have long been strictly competitive, is *the* cause of the continued duration of the Chinese nation; it is that which preserves the other causes and gives efficacy to their operation. By it all parents throughout the country who can compass the means are induced to impart to their sons an intimate knowledge of the literature which contains the three doctrines above cited, together with many others conducive to a high mental cultivation. By it all the ability of the country is enlisted on the side of that government which takes care to preserve its purity. By it, with its impartiality, the poorest man in the country is constrained to say that, if his lot in life is a low one, it is so in virtue of the "will of Heaven," and that no unjust barriers created by his fellow-men prevent him from elevating himself. In consequence of its neglect or corruption, if prolonged, the able men of the country are spurred by their natural and honourable ambition to the overthrow of the—in their eyes, and in the eyes of the nation—guilty rulers. A new dynasty is then established, which consolidates its power by restoring the institution in integrity and purity; and all the legislative and executive powers are again placed in the hands of the Heen-nang, the wise and able, who—the ablest men being always the best—rule the country, not only with great soundness of judgment, but with much of that 'righteousness and benevolence' which is dictated as well by their own moral nature as by the old and venerated rules of national polity. Then follows one of those long periods which are marked in Chinese history by the reign of justice, peace, content, cheerful industry, and general prosperity, and a glorious succession of which has made the Chinese people not only the oldest, but so vastly the largest of all the nations."

To be sure, it is often objected to examinations that they encourage cram; that men who are actually far superior to others seem at an examination to be as much inferior to them, owing to timidity, nervousness, and want of presence of mind; and, moreover, that proved intellectual excellence is no guarantee for moral worth. Now, let us see what vitality there is in each of these objections. Whatever force there may be in the objection against cram, as derived from the practice of the Universities, it cannot affect the examinations of the Society of Arts. What is the accepted meaning of the word cram? Why cram means this:—When a limited number of examiners, whose habits are indolent, and whose knowledge is stationary, continue for years, off and on, to examine in the same subjects, a sort of family likeness is found to grow up in their questions; it is discovered that the examiners have favourite text books—that they have a fancy for a certain point of view—that they are great sticklers for certain forms of notation, which very few care about but themselves, that they have pet questions as posers—that some are found to dislike finery in dress, or *vice versâ*. Now, acute men, taking advantage of these peculiarities and idiosyncracies, make themselves acquainted with the grooves in which the examiners run; they map out the field of subjects intersected by these educational railroads, and they sell the information thus laboriously acquired to those who will pay them for it. I have heard of one gentleman of this much maligned occupation who applied the doctrine of chances and the theory of probabilities with much show of mathematical reasoning and manipulation of x's and y's to prove that if Mr. A. examined, the odds were fifty to one he would ask a particular question about the binomial theorem, and thirty to one that, if Mr. B. examined, he would ask a pet question of his own in logarithms. But who would take the trouble to trace the bias of an examiner of the Society of Arts, or who is there to pay for such a detective-like proceeding? But it has been said, men who are well up in subjects often pass a poor examination in them, and are out-stripped by others whose knowledge in the same subjects is of a very meagre kind. But is not one of the principal objects of the examination-scheme to bring out—not merely the acquisitions made—to test not alone the intellectual capacity—but presence of mind, coolness, sagacity, and quickness in seizing the point of the question put by the examiner. These moral qualities, at least as regards the business of life, are not inferior in value to intellectual power. And, with regard to the last objection, it seems to be founded on some kind of a vague notion of distributive justice, that if one man is endowed with high intellectual qualities, it is only fair that his neighbour, who is confessedly an intensely stupid man, should get all the moral ones. We might just as well argue that a man of genius must be of diminutive stature, of mean presence, or of feeble constitution. But the Almighty does not dispense the gifts of mind or body by measure; more frequently the rule seems to be that to him that hath shall be given more abundantly. This plea, then, for the higher moral constitution of the stupid falls to the ground, ignored as it is by all experience. It would be very strange were it otherwise, for, as the Council of the Society of Arts very justly observe in the notice of their Public Registry: " a young man who must necessarily have devoted to study a large portion of the time at his disposal, often very scant, can scarcely have had much leisure for idle pursuits or vicious indulgences."

Having at considerable length brought under your notice the advantages of education, I now come to the question, how may education most effectually be promoted? And on this question we shall find as many varieties of opinion as there are different shades of the same colour. One man is for the *laissez faire*, the let alone principle; another says, let the State take the whole matter into its own hands, let it catch the truants, shut them up between four walls, and pour learning like physic down their throats. One man says, let us have a national tax for education. Oh, no, says a second, I am for a local rate. I am opposed to both your plans, cries a third; I am all for voluntary contributions. Away with centralisation, exclaims one man; it is Prussian and despotic. Down with local management, cries his adversary; it is corrupt, and fattens nests of jobbers. One man shouts for secular instruction, another will have nothing but purely religious teaching; while a third would attempt to combine them both. One man admits Dissenters openly to church schools; another would let them in by the back door; while a third would exclude them altogether. So on I might continue to raise a saddened smile, or provoke indignant laughter. Now, then, as there are so many opinions on this well-ventilated, certainly not winnowed question, for it contains plenty of chaff, I cannot much be blamed if I, too, like Diogenes, proceed to roll my tub. Well, then, my view is this. We shall never radically improve education until we create a demand for it. I am convinced that the relation of supply to demand holds as strictly in this case as in that of iron or coal. This is the great principle to establish. Once let it be widely known and clearly understood that a new order of things has arisen—that, however it may have been heretofore, men will be promoted for their industry and talent, instead of by personal favour, or through family influence. Do this, and immediately two distinct consequences will follow. You will have employments more economically, because better, filled than formerly; but far more than this will be the result. Education will receive an impetus which could be given it in no other way. I have no doubt whatever on my mind that within the last two years the government has done far more to promote and improve the education of the middle classes of this country, and to stimulate their energies by throwing open the appointments in the civil service of the East India Company to unrestricted competition, and by establishing examinations for official situations, than if they had founded fifty colleges in different parts of the country, and endowed 500 professorships in them. The means of knowledge and the facilities for learning are not difficult to obtain in this country. Everybody you meet is willing to give the struggling student a helping hand. What we lack is the strong propelling motive to indefatigable effort. Make education a necessary of life, and not merely a luxury, and depend upon it men will procure it, come by it how they may. Create the demand, and the supply is sure to follow. Whether England shall elevate the tone of its education or raise the standard of its instruction, is not a question for a government to decide. It does not depend on the Lords, it does not rest with the Commons: it is a question entirely within the control of the people themselves. Let the employers of labour promote only the educated and the industrious, and an ample supply of the educated and industrious will be forthcoming. Let them do this and then urge the government to follow their example. What can be more hypocritical or contemptible than for a man to make a speech, a flaming speech, perhaps, on the platform at some education meeting, abuse the government, censure the Committee of Council, hold up the finger of warning to the Church, and then go home and bestow any bit of patronage or office in his gift on the idle or worthless, on the mere ground of interest or acquaintance?

My arguments do not touch the case of the very poor, for whom the public is quite as much bound, under a common sense view of the case, to provide common learning, as it is to find common food or common clothing. If we admit the truth of principles long acted upon in this country, the question of public education needs no discussion to enable us to find its true solution. Some people talk a great deal about the state—they are afraid of the power of the state, they dread the influence of the state, they warn their neighbours against the encroaching despotism of the state. I believe the old Whig formula is gone somewhat out of fashion, " The power of the crown has increased, is increasing, and ought to be diminished." Now, people who speak of the state in this way seem to talk as if the state were some foreign mysterious power, incessantly striving to bring us all under its yoke—some foreign despotism, whose insidious encroachments on our liberties we ought ever to be on the watch against. Apprehensions such as these may have been very natural and well-founded in the reigns of Charles I. or James II., but now they are wholly groundless. So true it is that words and names—mere sounds—are indestructible, while the solid material—things they represent—have ages ago passed away. Where is the cross at Charing? or the knights templars of the Temple? or the convent which stood in Covent-garden? What is the state? The state is the government. What is the government? The creature of the House of Commons. What is the House of Commons? The creation of the people. Thus the voice of the state is the intensified voice of the people. We have no government in the proper sense of the word; that is, a body which originates measures on its own responsibility and is prepared to stand or fall by these measures. We have an administration prepared to embody into laws the clearly-expressed will of the people. Therefore, measures must be ventilated, as the phrase goes, before they can with any prospect of success be introduced into the House of Commons, and there they must pass through many stages of probation and trial before they are finally taken up by the government of the day and enshrined in the statute book. Hence in this country the necessity for agitation and the use of discussion. But I will not pursue this subject further.

I will conclude these lengthened observations by showing how this question of supply and demand in education affects the social standing of the educator. Now the value of the article in which the teacher deals, and the estimation in which he is held, will in a great measure determine his social standing. Where education is but lightly valued, its professors are but little esteemed. Where, as in the Universities, instruction in certain branches of knowledge may lead to honour or to social position, the teacher there may take a higher grade. Accordingly, we find that divinity, law, and medicine are called specially the learned professions, because the subjects about which they are occupied are some of the highest and most important which concern man either in his future or his present state. Consequently, wherever education his highly valued, the office of the educator stands high. In ignorant and barbarous communities he is either not found at all, or he is placed very near the bottom of the social scale. In ancient Greece, where philosophy was the highest and noblest subject of human thought, statesmen and generals were its lecturers. In ancient Rome, where philosophy was despised, its teachers were slaves. The conclusion I come to, therefore, is this, that the social standing of the teacher can only be advanced by enhancing the value of the article he trades in. When pupils shall flock in crowds after the teacher of knowledge, praying for admission to his lectures, he will take a very different position from that he now fills. At present Mr. Squeers is only too often the type of the schoolmaster in remote districts, and this brings me back again, by another train of thought, to the principle I set out with—that it is only by some such testing of results as I advocate that the honourable profession of teacher can be purged of such men. The state cannot interfere with them—they would refuse admission to Government or to any other inspectors. Parents of pupils are no judges of a schoolmaster's qualifications. It is only through some such testing tribunal as I advocate that the incompetency of men of this stamp could be detected and exposed through the proved ignorance of their pupils. The social position, then, of the schoolmaster can only be raised by elevating the educational platform on which he stands. The needs of society require that, while some are engaged in promting its welfare by improving themselves, others must devote their time to training the young to follow in the same course. We are compelled here as elsewhere to apply the great principle of the division of labour, on whose development the advancement of society mainly depends. There is a very admirable lecture, by Mr. Bazley, of Manchester, on the "Labour of Life." It has recently been published in a cheap form. I cannot do better than direct your attention to it. Speaking of mental labour, he says:—"With the progress and increase of society the number of those whose labour consists of mental rather than of physical exertion becomes more conspicuous. The pursuits of men being governed by the law of supply and demand, professions, as well as trade and commerce, are called into existence to suit the exigencies of the age. Professional men, consisting of medical practitioners, lawyers, clergymen, engineers, architects, and men of science, and of those upon whom the governing power of a country devolves, are as requisite for the good of the common weal as are those who perform bodily and visible labour. Indeed, the labour of the mind exceeds, in national importance and usefulness, the mere drudgery of muscle and of physical force. To the mental services of professors of every class the inhabitants of the earth owe an extent of gratitude which can never be sufficiently acknowledged. From the ancients and their successors, modern civilisation has derived the fruits of both accumulated labour and wisdom. Nor is the apparent leisure of many of the most intellectual occupations to be despised. Unfortunately, the ignorant do not appreciate mental labour, and, though the midnight student, wasting in power, like the flickering light of his lamp, may be developing the hidden treasures of nature, art, or science, and preparing for the beneficial and active exercise of some new industry, his toils are often unrewarded, and, with Butler, the eulogy of the monumental stone becomes his portion, instead of the bread which he needed."

But to return, the educator labours under other disadvantages. He finds great difficulty in augmenting the stock of his intellectual acquisitions. Now this to some persons may appear very strange, but so it is. There is no man, no matter what his occupation, business, or profession, if he have any leisure at all, who is not in a more favourable position to make intellectual progress than the schoolmaster. The reason is plain. A man of business who is engaged all day in his warehouse, or superintending his workmen, or transacting commercial affairs, when he returns home in the evening finds it a positive relief to take up a book or a subject of study, because in so doing he brings into play a set of faculties which were dormant during the day. This is the reason why so many merchants and other men of business have been distinguished for their attainments in literature or science. But when the schoolmaster has finished his day's work, if he takes up a book, he calls into action only faculties already jaded by the labours of the day. The wonder should be, therefore, that he has done so much, rather than that he should have done so little. But, however, this may be, you perform a work without which society could not well hold together—you expend your energies in improving others rather than in accomplishing yourselves—you have the priceless satisfaction of your own consciences that you do the work which is given you to do, and this is a reward which finally is the greatest we can, any of us, obtain. Yours is a great work, if you will only so regard it. A holy work, if only the spirit from above be given to enable you to concecrate it to its proper uses:—

> "All the means of action
> The shapeless masses, the materials
> Lie everywhere around us. What we need
> Is the celestial fire, to change the flint
> Into transparent crystal, bright and clear."

MEN AND MANUFACTURES.

By W. Bridges Adams.

Mr. J. P. Danson and Mr. Chadwick demur to my view of cotton manufactures in Lancashire, and the ultimate transfer to India of a large part of those operations. I assure Mr. Danson that I do not contemplate any sudden exodus to take place precisely on the 1st of January, 1857 or 1858. I merely look at this fact, that cotton is grown in India, and will ultimately be grown more largely as railways open up the means of exporting it; and that in the districts where it will be most largely grown, there exists an indigenous population, very docile and obedient, of the organisation precisely adapted for the textile arts, and who can be maintained on their own soil at a much cheaper rate than similar people can be bred and maintained at in Lancashire. And so soon as railways shall furnish the means of carrying machinery to these cotton-growing spots, English enterprise,—which will embark largely in cotton-growing, to the exclusion of the present miserable system in India, where monied men advance cash to the cultivator to buy the seed, and take a mortgage on the crop,—that English enterprise will also see the desirability of giving the crop additional value by spinning and weaving it, and thus practically lessening the cost of transit by the increased value of the commodity. Free Trade, of which Manchester has been the especial advocate, must bring this to pass. Free trade infallibly guides production to the locality of the greatest economy, and, therefore, the advantages preserved by Lancashire over India, because India is without roads, must disappear as fast as these roads shall be made. The elements of the cotton trade are—labour of a peculiar class,—climate, natural or artificial,—cotton, and machinery. India has the labour indigenous, the climate indigenous, the cotton indigenous, and lacks only the machinery. Lancashire has labour artificial, climate artificial, cotton artificial, and only machinery indigenous. Any political economist can work out the question of what the result will be when the machinery can get to India, the original seat of the cotton manufacture. How fast, or how slowly this may come to pass, may be matter of opinion; but in these days it would not be well to count too much on inertia, or build new mills in Lancashire too recklessly. There is no fear of this in shrewd Lancashire, where the signs of the times are read as aptly as anywhere. Indian workmen will need training, but the example once set, some twenty-five years would probably suffice to raise the new manufacture to a palmy condition, not again to be affected by foreign or home rivalry. If Mr. Danson be contemplating a new mill, he will do well to ponder over these things.

And now to Mr. Chadwick and "races of workmen." To avoid confusion, it will be as well just to settle our terms, about which Mr. Chadwick seems to labour under misapprehension. By the term Saxon, I mean that class of men found commonly in Sussex, mostly fair-haired and blue-eyed, of middle stature, very moderate acuteness of intellect, or delicacy of nerves, and great general robustness, and good digestion, the class of men, whether found in Sussex or elsewhere, from whom navvies and sailors and the best class of agricultural labourers spring instinctively.

By the term Celt, I mean that class of men found largely in Southern France, in Southern Ireland, and in some parts of the Scottish Highlands, men mostly dark-skinned and dark-haired, of little physical strength, as compared with the Saxon, but capable of occasional great nervous energy, of delicate organisation, and with acute perceptive faculties.

The Saxon belongs to the cold climate and open air work, that is, being trained in the cold climate, though he may work in the warm climate, it is not congenial to him. His labour of love is in the open air. The Celt belongs to the warm climate, and though he may work in the cold climate, it is not congenial to him. His "labour of love,"—when he loves to labour—is in the warm climate, or under shelter.

In speaking, therefore, of races of workmen, it must be understood that some countries and climates produce the Saxon variety in the greatest abundance—others the Celtic variety. But it is the intermingling of the two which produces what we are accustomed to consider as an Englishman—physical power united with mental acuteness.

"A man of the real grit" is an English provincial expression, sometimes used in the United States; "of the rock of the Hartzgeberge," say the Germans, both meaning that class of man whose instinct is to tame the beast to his uses, and create the field out of the *felled* forest—to span the wide river with a bridge or thread it with a boat—to ride the wide ocean with a ship—drain the morass—and level the mountain to make roads. Such men grow on soil congenial to them, and even Mr. Chadwick bears testimony to the virtue that dwells on Blackstone edge:—

> "The most eminent of the 'navvies' in England come from the hill districts of sandstone-grit and granite in Lancashire and other northern counties, where there are favourable sanitary conditions of pure soft water and forced ventilation, and some natural drainage by winds and storms. Their alimentation, too, has been generally good. Some of the leading navvies have represented to me that they consider eleven pounds of meat per head per week, a necessary of life for good work; but I should not accept this as to the species of diet as an absolute dogma, for they, themselves, have admitted to me that eaters of oatmeal and potatoes (with milk), though in great quantities, have done good work with them; what, however, appears to be certain is, that a superior alimentation at the least is required, though it is by no means the sole requisite, and mental as well as bodily stimuli are needed for the attainment of superior work.

Pure water, forced ventilation, natural drainage by winds and storms, and eleven pounds of meat per week on the grit and granite, go to the creation of the most eminent *navvies* in England, and that is, in other words, saying—the best soldiers and sailors also, the staple Englishman who practically demonstrates, day by day, that these islands and their dependencies belong to him and his race, from which they are not to be dislodged by any inferior races.

Mr. Chadwick will not assert that by any process he could convert these navvies into spinners and weavers, though he states that their descendants, born and bred in the cities, "lose on the average ten years of working ability." *A fortiori* what would they lose, kept in the hot and moist atmosphere essential to the perfect spinning and weaving of cotton?

Again, in Piedmont, we have this same kind of grit and granite-grown man, as Mr. Chadwick very clearly describes him:—

> "From time immemorial, the Piedmontese provinces of Ivrée, Brille, Varillo, and others, but *especially the high country near the lakes*, including the cantons of Arona and Bellazona, are in the habit of sending every year into other countries a considerable number of active and industrious men, who represent precisely this class of small contractors, the employment of whom has generally the best results. Many of these migrants are painters, plumbers, chimney-doctors, and decorators; but their most remarkable talent is that for 'navvying,' and for this qualification they are sought at great distances, as they will be wherever their work can be appreciated. In those *healthy* districts the peasantry have had for *a great number of generations substantial food*, as is generally the case in irrigated countries, where cattle are numerous. It is doubtless by these means that the Piedmontese 'navvy' is so indefatigable, and also exempt from the diseases that generally prevail amongst the labouring classes. I have seen them, without suffering any injury from it, remain twelve hours working in a deep cutting, with their heads uncovered, where the reverberation of an Italian sun would have been intolerable to men of any other mould. It is to be observed that they execute quickly and well whatever they undertake. To see them form a slope (*dresser un talus*), or dislodge a rock, either with the pickaxe or with powder, one cannot help asking—Are they not rather artists than labourers? For they have the secret of combining an extraordinary speed in the work they undertake, with the most perfect execution; and herein lies their great value. They will not accept work by the day; but it is not their habit to work lazily, and even the highest wages barely remunerate their labour."

Painters, plumbers, chimney-doctors, and decorators, still we do not find them working in cotton-mills!

Mr. Chadwick imputes to me as an offence that I consider our own race to be superior, though almost in the same breath he asserts that English labour is cheaper and better than any continental labour. We scarcely require his assurance that the children of Saxons and Celts, and all other manner of men, can be trained to industry or idleness, comfort or misery, but this is not the question. In choosing occupations for the children of men, we should have regard to their natural aptitude. We should naturally choose the Saxon, the men of "grit," for the land and out-door work, and take the Celt for the artist and in-door work. We may, it is true, breed down the Saxon till he becomes enfeebled enough to spin, piece, and weave, without the surplus energy that breaks threads instead of mending them; but we had better take the smaller-bodied and lighter-fingered Celt.

If Mr. Chadwick will demonstrate that in the hot and moist climates or temperatures good for spinning cotton thread—and the identical temperature of liver complaints—he can breed up strong men fit to take suit and service in the battle-field, if need be, my argument is at an end; but if we can only maintain our cotton manufactures by the depreciation of our men, then we had better let them go to that other class of British subjects who inhabit British India. Mr. Chadwick quotes an opinion of Count Gasparin, in France, on the qualities of men:—

> "Beware! you will not get from land there the promised return. I know the men of that country; they want activity; the pupils who come from it to our veterinary school do not strike hard upon the anvil!" 'What fine and just appreciation!' exclaims the Count. There, where the labourer's arm is enervated, whether by physical debility, arising from a bad regime, or by long habits of idleness—there, where they do not strike hard upon the anvil, the value of the land is affected by their depression! Of old our forefathers said, 'Tant vaut l'homme, tant vaut la terre'—(as is the worth of the labourer, so is the worth of the land)."

Can the men of our Lancashire cotton mills "strike hard upon the anvil?" If not, "as is the worth of the labourer, so is the worth of the land." If ever the spinning and weaving of textile materials shall become our chief employment, we shall find soon some foreign conqueror, who will rule us as we now rule the natives of India, though probably with less justice and more hardship. Before it comes to that we shall get some "commissions of inquiry" as to which are our most desirable trades to follow.

Mr. Chadwick is a better collector of data for verification than a logician. He quotes precedent for denominating Mr. John Kennedy "the father of the cotton manufacture," in the exchange of cotton compliments at Manchester, but he would have done better to have quoted a fact than a fiction. Father-in-law would have been the more correct term. A very valuable and worthy man was Mr. Kennedy, though not a Lancashire man—one whose sterling merits could very well dispense with a factitious reputation.

In using the term, "slaves of the mill," I speak advisedly. If a large number of people are brought up to no process of getting a living save working in cotton mills, and are physically unfitted for other work thereby, legal freedom in no way helps their practical compulsion. The farmer races, whom Mr. Chadwick describes as alternating the labour of the field with that of the loom in their own dwellings in bad weather or darkness, might say "nay" to the mill owners' wages, but they are not of the class to weave miles of cotton cloth for export. They and their wives spun and wove "homespun" goods for home wear, but did not deal in what Cobbett, with a sort of rough though bigoted perception, called "the flimsy fabrics of Sir Robert Peel."

INDIAN IRON.

The Government of Bengal has just published a report on a new iron field examined by Mr. Smith, a viewer, sent out by the Court of Directors. It is at Barrool, a place about ten miles beyond Raneegunge, the last station on the existing railway. It is close to the coal mines, and the means of carriage both by rail and water are close at hand. The quantity of ore Mr. Smith estimates at about 6,400,000 tons to the square mile, but the limits of the field remain to be ascertained. The first pit, says Mr. Smith, "was sunk to a depth of 32 feet, intersecting to that depth four seams of iron ore, of the aggregate thickness of 18 inches, which with the seams before known make a total of 38 inches of clay iron ore of very superior quality. In addition to these, a vein of carbonifererous iron ore, known at home as 'black band,' was passed through, 3 feet 6 inches thick. It is not nearly so rich in iron as the Scotch black band, and is estimated to yield no more than from 20 to 23 per cent. in its raw state; but when calcined—a process which this ore, as well as all the clay ores found here, must go through before introduction to the blast furnace—it will yield over 40 per cent. of iron." A further trial was made under the superintendence of Mr. Biddle, and the pit "has been continued to a depth of 51 feet 11 inches, another seam of ore, 2 feet 4 inches, and by analysis containing 42 per cent. of iron, being discovered; so that, in a shallow section of 52 feet, we have 38 inches in separate beds of excellent clay iron ore, and 52 inches of carboniferous or black band iron ore." Cheap indigenous iron, sufficiently good for rails, is at this moment the want of India. The railway is not advancing very fast, but, had it been pushed on as was originally expected, the works would have been at a dead lock for want of permanent way. There is a large mining population in the neighbourhood of Barrool, while the great reservoir of labour, the Dhangur and Cale villages, are within an accessible distance. The land belongs, it is believed, to the Bengal Coal Company, which is about to commence experiments in the manufacture of iron.

Proceedings of Institutions.

Islington.—The Literary and Scientific Society have engaged Professor Levi to deliver four lectures on "The History and Principles of Commerce and Banking," on January 19th and the three following Monday evenings. The Committee propose sending a certain number of free tickets to each of the leading banking establishments of London.

Mitcham.—At the Literary Institution, on Tuesday evening, the 25th Nov., Mr. P. L. Simmonds delivered a lecture to the members of the above Institution, "On the Food Delicacies of Various Nations." The lecturer had accumulated a vast fund of information on the subject, and described the substances used for food in different parts of the world, from the sea-slugs, rats, &c., of China, to the refined condiments of Soyer, in a most interesting manner. The lecture was illustrated by a collection of many preserved articles, used as food in different parts of the world.

Northowram.—The fifth annual report of the Mechanics' Institution congratulates the members on the satisfactory progress made during the past year. One principal cause of this improvement had been the removal of the institution from the inconvenient premises it formerly occupied to a commodious room, for the gratuitous use of which the directors were indebted to the chairman, Michael Stocks, Esq., at whose expense it was built, and to the Rev. W. H. Wawn. Two lectures only had been given during the year—one by the Rev. J. V. Macrae, the other by Mr. Washington, the vice-president; but the directors contemplated arranging a course for the ensuing season. The directors' were happy to say that the classes had been fairly successful. They had had the advantage of the valuable aid of Mr. Washington, assisted by Messrs. Holt, Smith, Hebblethwaite, and Wood. Instruction had been given in reading, writing, dictation, arithmetic, and grammar. The attendance at present was 33, with a prospect of a further increase. The female classes met every Tuesday and Thursday, under the superintendence of a committee, consisting of ladies; and the directors tendered their cordial thanks to Mrs. Wawn, the Misses Emmett, Miss Carter, Miss Crawshaw, Miss Crewdson, Miss Jagger, and Miss Appleyard, who had taken upon themselves the care of these classes, which were making considerable progress in reading, writing, and domestic economy. The members of the Institution numbered 91, of whom 1 was an honorary member, 13 were annual subscribers, 13 quarterly subscribers, 31 who attended the male classes, 26 who attended the female classes, and 7 nominees recommended by subscribers of £1 per annum. The increase, when compared with the corresponding period of last year, was not less than 54. Thirty-one volumes had been purchased and added to the library during the year, besides which the institution was much indebted to several friends for their kind contributions. The present number of books is 185, being 78 volumes more than at the last annual meeting. The financial state of the Institution is very good, and the directors tender their thanks to those gentlemen who kindly assisted them by their annual subscriptions.

Southam.—A meeting was held at the Court-house, on Tuesday, the 10th ult., in connection with the Mutual Improvement Society established at Southam, at which upwards of two hundred persons were present, comprising members of the working as well as of the higher class, the Rev. J. W. Webb, curate of Southam, in the chair. The proceedings of the evening were interspersed with some excellent music. After a few introductory remarks from the chairman, H. L. Smith, Esq., rose to propose —"That this meeting is of opinion that immediate steps should be taken to extend the influence and to increase the number of members of the Southam Mutual Improvement Society; and this meeting pledges itself to use every exertion to produce this desired result." After speaking of various causes which had influenced the success of similar Societies, he said that one reason why the working classes did not attend Institutions of that kind was the unfortunate prejudice embodied in the words "I don't see the use of it." Actuated by those prejudices, they also withdrew their children from school before they had had time to learn anything. And they were not altogether to blame for that. Till very recently, little had been done to induce them to adopt a different course. Lately, an idea had been put forth which, if carried out, might have a most salutary effect. It was, that in public offices, railway offices, banking establishments, and in the shops of tradespeople, the persons employed should have been educated, and have obtained certificates of qualification. The idea sprang from the inefficient manner in which some departments of the Crimean army, the Commissariat, &c., were carried out, and the people found fault with the government, whilst they practised a similar system themselves. In private commercial establishments, £70, £80, £100, £200, and higher sums per year were bestowed, by favouritism, upon persons much less qualified to undertake the duties than others who were entirely overlooked. That evil might easily be remedied by the simple plan of throwing open their offices, without any favour, to those who had received certificates as to talent and conduct. Mr. Smith then gave instances of the manner in which some even responsible situations were filled. After speaking of the advantages of regular instruction, and specially advocating the establishment of classes, Mr. Smith mentioned several gentlemen who had kindly promised to give lectures during the winter, and expressed an earnest hope that they would be well attended. The resolution was seconded by Dr. Stillman, and after addresses from Messrs. R. F. Welchman, E. Poole, Bickerdike, W. Blundell, and J. Read, the meeting separated.

MEETINGS FOR THE ENSUING WEEK.

Mon.. London Institution, 7. Dr. John Tyndall, "On the Nature and Phenomena of Light."
Entomological, 8.
Tues. Royal Institution, 3. Professor Faraday, "The Attractions of the Magnet."
Pathological, 8. Anniversary.
Wed. London Institution, 3. Professor Rymer Jones, "On Vivaria and their Inhabitants."
Geological, 8. I. Prof. Owen, F.G.S., "On the Dichodon Cuspidatus from the Isle of Wight." II. Prof. Owen, F.G.S., "On a Fossil Serpent from Salonika." III. Mr. J. W. Salter, F.G.S., "On some additional Fossils from the Longwynd." IV. Prof. W. Thomson and Mr. J. W. Salter, F.G.S., "On some new Silurian Species of Acidaspis from Ayrshire and Shropshire."
Pharmaceutical, 8½.
Royal Soc. Literature, 8½.
Thurs. Royal Institution, 3. Prof. Faraday, "The Way in which the Attractions of the Magnet are Related to and Produced by each other."
Royal Society Club, 6.
London Institution, 7. Dr. R. E. Grant, "On the Natural History of Extinct Animals."
Antiquaries, 8.
Photographic, 8.
Royal, 8½.
Fri. Astronomical, 8.
Sat. London Institution, 3. Mr. T. A. Malone, "On Experimental Physics, chiefly in Relation to Cohemistry."
Medical, 8.

PATENT LAW AMENDMENT ACT.

APPLICATIONS FOR PATENTS AND PROTECTION ALLOWED.

[*From Gazette, December* 26*th*, 1856.]

Dated 8th September, 1856.

2092. Boniface Sabatier, Paris—Improvements in photography.

Dated 8th October, 1856.

2358. David Joy and William Holt, Leeds—Improvements in hydraulic motive power engines, and the application thereof to certain useful purposes.

Dated 31st October, 1856.

2476. William Edward Newton, 66, Chancery-lane—Improved machinery for rolling and forging iron or steel. (A communication.)

Dated 81st October, 1856.

2559. Didier Elizabeth Ernest Ausset de Chavanon, Paris—Improvements in cleaning all sorts of cloth fabrics and skins, by the application of a substance so called Carburine.

Dated 19th November, 1856.

2728. Thomas Gilman, 12, Creed-lane, Ludgate-hill—Improvements in boxes or packing cases.

2737. James Yearsley, Saville-row—An improved method of and instrument for applying artificial tympanums.

Dated 20th November, 1856.

2754. William Irlam and John Phillips, Gibraltar Iron Works, Newton Heath, near Manchester—Improvements in working railway signals or alarums.

Dated 28th November, 1856.

2813. Robert Griffiths, 69, Mornington-road, Regent's-park—Improvements in vessels and engines for propelling vessels.

2820. Henry Waller, Lickhill, near Calne—Improvements applicable to vessels used in the manufacture of cheese.

Dated 29th November, 1856.

2827. Lemuel Wellman Wright, Sydenham—Improvements in machinery for bending plates for the formation of pipes and tubes.

Dated 1st December, 1856.

2840. George Collier, Halifax, and James William Crossley, Brighouse, Yorkshire—Improvements in apparatus used in hot-pressing and in the means of manufacturing parts of apparatus used for such purpose.

Dated 3rd December, 1856.

2862. James Mizen, Deptford—Improvements in apparatus for making gas, partly applicable to culinary or other domestic purposes.

Dated 6th December, 1856.

2894. William Hadfield Bowers, Gorton, Manchester—Improvements in apparatus to be used for the purposes of distillation.

2896. Christian Schiele, Oldham—Certain improvements in machinery or apparatus for cutting nuts, screws, or bolts, and toothed wheels.

2898. John Longbottom, Leeds—Improvements in generating, surcharging, or superheating steam.

2900. Henry Twisleton Elliston, Leamington—A new or improved method of hanging and closing doors.

2902. John Leslie, Conduit-street—An improvement in stoves and fire-places.

Dated 8th December, 1856.

2904. George Collier, Halifax, and Edwin Heywood, Sutton Crosshills, near Leeds—Improvements in steam boilers or steam-generators.

2906. John Aston and John Brant, Birmingham—An improvement in the manufacture of covered buttons and covered ornaments.

2908. James Blain, Belfast—Improvements in Jacquard apparatus for weaving.

2910. Robert Frederick Miller, Hammersmith—A mode of printing tables of fares, advertisements, notices, tablets, ornamental designs, figures, and other like announcements on painted or other surfaces to supersede writing.

Dated 9th December, 1856.

2912. Josiah Harris, Frodsham, Cheshire—A Pneumatic Signal Apparatus, and mode of working the same.

2914. John Browning, 111, Minories—Improvements in stereoscopes.

2920. Joseph Walton, Styal, near Wilmslow, Chester—Improvements in tables.

2922. Edmund Knowles Muspratt, Liverpool, and Balthazar Wilhelm Gerland, Hesse Cassel, now in Manchester—Improvements in treating waste liquors produced in the manufacture of chlorine, and in separating nickel, cobalt, and copper from liquids containing them in combination with manganese and iron.

2924. Frederick Oldfield Ward, and Frederic Wynauts, Rue de la Paix, Brabant, Belgium—Improvements in the manufacture of manures.

Dated 10th December, 1856.

2926. William Storey and Thomas Storey, Lancaster—Improvements in forming ornamental devices on the surface of paper and certain prepared woven fabrics.

2927. Alexander Macarthur, Dalsholm Paper Works, Dumbarton, N.B.—Improvements in boiling, bleaching, washing, or cleansing fibrous materials.

2928. William Edward Newton, 66, Chancery-lane—Improved apparatus for supplying steam boilers with water. (A communication.)

2929. Thomas Smith, West Smithfield—An improved joint for folding handles or sticks of umbrellas and parasols.

2930. John Cornes, Swan-lane—Improvements in chaff-cutting machines.

Dated 11th December, 1856.

2931. Jacob Green, Philadelphia, U.S.—Improvements in the mode of manufacturing glass lights for street vaults, ships, buildings, and friction boxes, and the apparatus for ladling or conveying the molten glass from one furnace to another.

2934. Michael Burke, Liverpool—Improvements in mariners' compasses to counteract local attraction.

2935. Michael Burke, Liverpool—Improvements in the construction of anchors.

2936. Thomas Wheatley and William Wheatley, Openshaw, near Manchester—Improvements in fog-signals and in the means of working the same.

2937. William Walker Reay, Birmingham—An improvement or improvements in shoes for horses and other animals.

2938. Victor Delperdange, Rue Verte, No. 125, Schaerbeeck, near Brussels—Improvements in metallic and elastic packing.

2939. Richard Emery, 6, King-street, St. James's-square—Improvements in the construction of certain kinds of agricultural implements (for breaking clogs of earth and levelling the soil), called harrows.

2940. William Lund, Fleet-street—An improved "spring clip," for holding or retaining loose papers, or other loose articles.

2941. George Collier, Halifax—Improvements in machinery or apparatus for the manufacture of piled fabrics.

2942. Frederick William Anderton and Joseph Beanland, Bradford, Yorkshire—Improvements in apparatus or means in connection with furnaces to facilitate the consumption of smoke.

2943. William Charles Theodore Schaeffer, 3, Great Winchester-street—Improvements in distilling fatty and oily matters.

2944. William Player Miles, Patent Lock Factory, near Forest Hill Station, L. and B. R.—Improvements in locks and fastenings. (A communication.)

2945. Charles Humfrey, 14, The Terrace, Camberwell—The application and use of paraffine in the manufacture of hair-oils, ointments, and plaisters for medical purposes.
2946. Henry King, Frome, Somerset—Improvements in machinery for thrashing and dressing wheat and other grain.
2947. William Colborne Cambridge, Bristol—An improved construction of portable railway.
2948. Louis Joseph Frédéric Margueritte, Paris—Improvements in purifying rock and sea-salt.

Dated 12th December, 1856.

2949. Peter Armand le Comte de Fontainemoreau, 39, Rue de l'Echiquier, Paris—Improved railway signal apparatus. (A communication.)
2950. John Turner Wright, and Edwin Payton Wright, Birmingham—A new or improved manufacture of ropes, cords, lines, twines, and mill bandings.
2951. Rafaello Louis Giandonati, of the firm Dodge, Bacon, and Co., St. Paul's Church-yard—Improvements in overshoes. (A communication.)
2952. Edward Paton and Charles Frederick Walsh, Perth, N.B.—Improvements in apparatus for charging and capping the nipples of fire-arms.
2953. William Foster, Black Dike Mills, Bradford, Yorkshire—Improvements in petticoats.
2955. John Cawood, James Beeson, William Smith, and Richard Henchley, Derby—Improvements in the valves of steam engines.
2956. James Hartas Headley, Walpole, county Haldimand, Canada—An improved mode of manufacturing artificial granite in various forms, and plating or veneering the same with marble, so as to present an exterior of marble and an interior of stone or granite.
2957. Henry Pease, Pierremont, near Darlington, and Thomas Richardson, Newcastle-on-Tyne—Improvements in the manufacture of compounds of alumina.
2958. Samuel Newington, Ticehurst, Sussex—Improvements in hand hoes and cultivators.
2959. William Beevers Birkby, Upper Rawfolds Card Works, Cleckheaton, near Leeds—Improvements in the manufacture of pointed wire fillets used in the preparation of flax, tow, hemp, and other fibrous substances.
2960. George Sherwin, 168, Waterloo-road, Burslem, Staffordshire—Improvements in the manufacture of fire bricks, tiles, crucibles, and other articles, where fire clay is used.
2961. George Tomlinson Bousfield, Sussex-place, Loughborough-road, Brixton—Improvements in looms for weaving cut piled fabrics double. (A communication.)

Dated 13th December, 1856.

2963. John Smith, Failsworth, near Manchester—Improvements in Jacquard machines for weaving.
2964. Louis Braun, Wood-street, City—Improvements in caps and such like articles.
2965. John Metcalf, Newton Heath, near Manchester—Improvements in the manufacture of alum or sulphate of alumina.
2966. Henry Wickens, Tokenhouse-yard—A throat guard or apparatus for protecting the throat against garotting or other external violence.
2967. James Wadsworth, Hazelgrove, near Stockport—Certain improvements in heating and ventilating apartments, buildings, and ships, and in apparatus applicable to and to be used for such purposes.
2968. George Littlewood, 93, London Wall—Improvements in printing geometric patterns.
2969. Archibald Turner, Leicester—Improvements in the manufacture of elastic fabrics.

Dated 15th December, 1856.

2970. John Grant, Hyde-park-street—Improvements in heating or cooking by gas, and in apparatus for effecting the same.
2971. John Millner, 15, Charlwood-street, Pimlico—Improvements in chimney cans or caps.
2972. Luke Duncan Jackson, Underwood, Nottinghamshire—A pneumatic break or apparatus to be attached to railway carriages or trucks for the purpose of retarding or stopping the same.
2973. Auguste Fournier des Corats, 8, Rue des Trois Pavillons, Paris—Certain improvement in lamps.
2274. Alfred Vincent Newton, 66, Chancery-lane—Improvements in machinery for boring, turning, tapping, and screwing fittings for gas, water, steam, and other pipes, and in vices for holding the same when they are operated upon. (A communication.)

Dated 16th December, 1856.

2975. William Austin, Upper Portland-place, Wandsworth-road—Improvements in pipes or tubes, and in the method of joining and laying the same.
2977. Edwin Heywood, Sutton Cross Hills, near Leeds—Improvements in machinery or apparatus used in weaving.
2979. William Carwood, Back Church-lane—An improvement in steam engines.
2981. John Stobo, Leven Bank Works, Dumbarton, N.B.—Improvements in forcing or lifting corrosive or chemical liquids.
2983. William Edward Newton, 66, Chancery-lane—An improved process or processes of treating feldspar so that it may be used as a manure, or for obtaining potash or soda therefrom. (A communication.)

WEEKLY LIST OF PATENTS SEALED.

December 24th.

1500. Louis Cornides.
1517. Edward Burnand.
1534. Cornelius Moriarty.
1591. George Sampson.
1627. Richard Dugdale Kay.
1628. Robert Thomas Eadon.
1640. Thomas Charlton and William Turnbull.
1664. Arthur Neild.
1678. George Eskholme and H. Wilkes.
1683. John Cartwright.
1704. William Stettinius Clark.
1728. Alfred Vincent Newton.
1736. John Imray.
1850. Augustus Pfaltz.
1890. Edwin Firth.
1902. Thomas Bilbe.
2131. Constant Jouffroy Duméry.
2132. William Stettinius Clark.
2199. Amos Hustler.
2219. Robert Mushet.
2220. Robert Mushet.
2224. Thomas Wallace.
2267. Frederick Ransome.
2319. George Fergusson Wilson and Alex. Isaac Austen.
2330. Maria Farina.
2333. John Gedge.
2348. George Fergusson Wilson.
2368. William Nairne.
2390. Gustav Scheurmann.
2391. Léopold Ador and Edouard Abbadie.
2471. John Shaw.
2500. William Woodford.

December 30th.

1537. Frederick George Sanders.
1538. Alfred Wild.
1539. John Coope Haddan.
1540. James Atkinson Longridge.
1545. George Tomlinson Bousfield.
1569. Edwin Greenslade Bradford.
1624. William Robertson.
1635. John Fowler and William Worby.
1665. John Henry Johnson.
1670. Henry Turner.
1677. John Henry Johnson.
1684. The Rev. George Jacque.
1755. Charles Burton.
1766. Edward Lord, Thos. Lord, Abraham Lord, and Wm. Lord.
1768. Thomas Byford.
1769. Robert Stewart.
1794. William Edward Newton.
1818. Alexandre Tolhausen.
1943. John Henry Johnson.
1948. Jules Laleman.
2153. John Knowelden.
2168. Robert Mushet.
2170. Robert Mushet.
2329. Walmsley Preston.
2363. Wm. Stettinius Clark.
2367. Charles Burton.
2402. Samuel Bremner.
2428. George Wilson.
2443. Leon Joseph Pomme de Mirimonde.
2455. Robert George Barrow.
2462. Henry Deacon.
2486. George Edward Johns.
2556. Charles Augustus Ferguson

PATENTS ON WHICH THE THIRD YEAR'S STAMP DUTY HAS BEEN PAID.

December 18th.

3009. John Barnes.

December 19th.

2966. Gotlieb Boccius.

December 20th.

2985. Francis Bennoch.
3004. James Taylor.

December 23rd.

3000. Thomas Symes Prideaux.
3026. Henri Catherine Camille de Ruolz and Anselme De Fontenay.

December 24th.

3028. Walter Mabon.
16. Thomas Mann.
33. John Healey.

December 26th.

2996. Edward Joseph Hughes.
3002. John Parkinson.
3020. Claude Alphonse Roux.

WEEKLY LIST OF DESIGNS FOR ARTICLES OF UTILITY REGISTERED.

No. in the Register.	Date of Registration.	Title.	Proprietors' Name.	Address.
3919	Dec. 17.	Improved Sawing and Tenoning Machine	George John Calvert and Co.	York.
3920	,, ,,	Flexible Felt Banded Hat	Benjamin Wilson	52, Bow-lane, City.
3921	,, 22.	The Albany Shirt	Dent, Allcroft, and Co.	Wood-street, City.
3922	,, ,,	The Parallel Arrow Point	James Buchanan John Newark, and Joseph Sergeant Rock	215, Piccadilly. Coventry.
3923	,, 23.	Fastening for Coffin and other Handles, Trusses, Brackets, and other such-like Articles	Edward Nevill	Birmingham.
3924	,, 29.	Inkstand	Thomas Pemberton and Sons.	Birmingham.
3925	,, 30.	Metallic Pen	Gustavus Geo. Antonio Ludwig Michael Schelhorn	Birmingham.
3926	,, ,,	Improved Stay Fastener	Robert Boswell	Islington.

Journal of the Society of Arts.

FRIDAY, JANUARY 9, 1857.

NOTICE TO MEMBERS.

Members residing within the London Postal Districts, are requested to communicate to the Secretary of the Society of Arts the district in which they reside, so that the proper initial letters may be added to their addresses, in order to facilitate the delivery of their letters through the Post-office.

THE SUPPOSED REMEDIES FOR SNAKE BITES.

By P. L. Simmonds.

I am glad to find that the subject which I opened up a month or two ago on snakes, and the supposed remedies for snake bites, is leading to experimental researches and discussions which are so calculated to elicit some degree of useful information. Whether looked at in a selfish or in a philanthropical point of view, it will be interesting to very many persons resident abroad, and to some of the Societies in Union. It is impossible, in countries where snakes are common, to say how soon a snake-bite may call upon individuals, either for themselves or their neighbours, to make use of such appliances as they have heard to be efficacious under similar circumstances. The subject, as Judge Temple observes, is " one of paramount importance to all those whose destiny leads them to pass much of their time amongst the jungles of India or the dense forests of Central America."

Much confusion has arisen from the common name of snake-root given to the roots of several plants, and it is often difficult to ascertain whether the name has been applied from any supposed beneficial properties as an antidote, or merely from the contortions and convolutions of the roots.

There seems to be a prevalent idea among medical men generally, that there is no specific, particularly in the vegetable kingdom, against the bite of venomous snakes; and to such an extent did Fontana carry his prejudice, that, on hearing of a cure effected in London, by Dr. Mead, of a man who was bitten by a rattlesnake, he said, " The rattlesnake might have been destitute of venom; it might have bitten superficially, and so ill, that the poison introduced was not in sufficient quantity to occasion death; a vein or artery, torn by its tooth, might have forced out all the poison, or a part of it." Such reasoning could only come from a man determined not to be convinced. The wiser plan, surely, is to be prepared, in case of necessity, with such means as have been well recommended.

When we know of such powerful vegetable products as manchineel, hemlock, aconite, opium, nux-vomica, upas or antjas, tanghinia, henbane, datura, belladonna, and croton, with many others, I think we may, without encouraging very whimsical notions, fairly hope to find some specific amongst vegetables, even against the direful and sudden effects produced by snake-bites.

In Ceylon the leaves and roots of the *Croton tiglium* are applied internally by the natives in cases of snake-bites. The *Aristolochia Indica* is also used in cases of venomous stings. The Virginian snake-root, or butter-wort (*Aristolochia serpentaria*), was once much used to cure the bite of venomous serpents, and great confidence was placed in it. From this circumstance it has derived its name, but, at the present day, it has lost its reputation, and is seldom or ever used. The root of *Liatris spicata*, known as "the button-snake-root," and "rattlesnake's master," when bruised, is, in America, applied externally for snake-bites, and a decoction of it drunk freely. There is another button-snake-root, the *Eryngium aquaticum* of the United States Pharmacopœia.

It is generally believed, by natives of India, that the seeds of *strychnos nux vomica*, habitually taken in small doses, will prove a safeguard against the poisonous effects of snake-bites. The bark of the tree is given with *aristolochia*, and with an undefined plant, named by the natives *Nangina pusjhum*, in the cachectic state produced by the bite of poisonous snakes, after the first symptoms are relieved. Diet requires attention; oils and acids must be avoided during its use.

In the catalogue of the Madras Exhibition, mention is made of another plant similarly used, but only the native names are given. The Canarese name being Ankolay Beejan, the Tamil, Allingie Verei. The kernels, bruised and fried in castor oil, are said to be applied to the eyes, as a stimulant to raise the system from the coma produced by snake-bites.

Piso, in his account of the snakes of Brazil, mentions the root of the jurubeba plant as being efficacious in curing the bites of snakes. It is stated to be a small shrub, which bears a fruit resembling the potato apple. The difficulty in all these cases is the identification of the plant, from the absence of any botanical name or description.

The black snake-root, or *Cohosh Cimicifuga racemosa*, is also sold by herbalists under the name of rattlesnake-root, but more from its contorted form than, I believe, from any properties it possesses as an antidote or curative.

The sudorific sub-aromatic roots of *Scorzonera hispanica* (Linnæus), are believed by the Spaniards to be a specific against snake-bites, and hence the plant bears the common name of viper's grass. A decoction of the root of *Indigo fera anil*, in conjunction with some kind of grass root and black pepper, is considered useful in the East, in the state of cahœkia produced by snake-bites.

Dr. Elliott, of Ceylon, in his paper, the *Columbo Observer*, commenting upon a death from the bite of a snake recently, gives the following information and advice:—

" The snake's tooth, like the cat's claw, does not penetrate deeply—and for the same reason, both being loose in the socket, in order that the hold may be easily abandoned at any moment. Were either fixed at the root it would penetrate deeply and be frequently broken. For this reason the snake's tooth merely scrapes the surface, and therefore the part is easily cut out without the slightest danger. For this purpose it is only necessary to pinch up the skin between the finger and thumb, and cut off with a pen-knife, razor, or table-knife, a piece about the size of a six-pence. We have frequently explained that this may be done on any part of the body without the slightest apprehension of danger, as no blood vessel of any consequence can be injured by such a wound in any part of the body whatever. The idea of hemorrhage from the cut, as well as the utter uselessness of internal medicines should be dismissed from the mind; and the perfect safety and success of cutting out a piece of skin be impressed upon the memory.

" It so happened that a few nights after the above mentioned death was related to us, a horsekeeper, who had been bitten in the foot by a snake, was brought to our door. The pain was most intense, and, as usual, gradually passing up the limb; but no mark whatever of the bite could be seen, which is not unfrequently the case in the dark skin, especially at night. He pointed as nearly as he could (for the sensation in the part is for the time destroyed) to the spot, which was on the side of the small toe. A piece of skin about the size of a four-pence was cut out—an operation which gave him no pain whatever—that is he did not feel the pain of the cutting—a circumstance we have almost invariably noticed in these cases, and which ought to remove any reluctance there might be in resorting to the knife. In a few minutes the pain began to descend along the limb, until the expiration of perhaps ten minutes, when it entirely subsided; and then, but not till then, did the pain of the cut become perceptible. This too is a most interesting fact, and accords with our experience in almost all cases; so long as the poison remains the pain from the cut is not felt; the latter being perceived only on the subsidence of the former; and when this takes place it is the signal that all danger has passed. The course is generally as follows: Intense pain is at first experienced at the seat of the bite, but in a few minutes it begins to ascend the limb, until the lapse of half or three quarters of an hour, when it has reached the loins, if the bite be on the leg, or the neck if on the hand. The piece is then cut out without being felt, and within a few minutes the pain commences to leave the upper parts, gradually descending along the limb until it reaches the wound, when the cut begins to be felt.

"The relief of intense pain would alone justify the cutting out a piece of skin the size of a sixpence; but surely the conviction that life or death is the alternative will nerve the most timid to perform such a trifling operation."

The following communication by Dr. Cameron, was addressed to the Superintending Surgeon at Kurrachee, regarding a cure for snake bites:

"Being aware how much public attention has been excited of late in this Province, from the frequent deaths caused by snake bites, and being quite alive to the great importance of the subject, it affords me much pleasure to forward the accompanying statement of successful termination to a snake bite, that has lately come under my notice, together with a few observations that I venture to offer on the subject, which I do with much diffidence, but with a sincere desire that they may be of benefit. I also hope that the statement forwarded may be the means of shewing that a person so bitten need not by any means despair, but rather be led to use the remedial measures pointed out, and which, I trust, may be the means of saving human life.

"In forwarding the snake called "Kuppa," that inflicted the wound, I regret not having had an opportunity of examining its head, which was destroyed when it was killed; Captain Jameson, Deputy Collector of Nowshera however, at once recognized it as being of a kind whose bite caused numerous deaths in his own Collectorate, and throughout Sind, and says, that it is of the most poisonous kind.

"On the 12th September, 1855, at 4 o'clock p.m., Nursoo, Commissariat cart driver, was brought to the Artillery Hospital, stating that he had been bitten by a snake hardly five minutes previously, in one of his fingers. Mr. Rourke, the assistant-apothecary, on examination, found two punctured marks near the end of the little finger on his left hand. On my arrival at the Hospital a few minutes afterwards, I saw the man, and the snake that inflicted the wound was pointed out to me. I found that Mr. Rourke had most judiciously lanced the punctured wounds, laying them open, and causing them to bleed freely, and was washing the scarified parts with warm water. This having been done, I made the man put his mouth to the wounded part, and told him to suck as vigorously as possible; this was continued for upwards of an hour, during which he had occasional doses of ammonia. The wounds were then covered over with a paste made of Pulvis Ipecacuanha. I appointed people to sit up with him by turns all night, desiring that I might be made acquainted should he become at all worse. No bad symptom, however, supervened, and when I saw him next morning he said, beyond his finger that side of his hand and arm feeling rather benumbed, he was quite comfortable, and he left hospital during the day well.

"In the foregoing, by scarifying the puncture and causing it to bleed freely, two objects are attained; first, that by the local bleeding, the absorption of the virus into the system is rendered less rapid, while the flowing of the blood may remove some of the virus itself that has been injected into the wound, besides which, it, by this means, is enlarged, rendering it less difficult to wash the puncture, which is the next thing that should be done. After the wound has been well and expeditiously washed, the mouth, which in this instance acts the part of a cupping glass, with this beneficial difference, that it can suit itself to every part, as in the case adduced above, when the finger was the part bitten, while the cupping glass can only be applied to certain parts. I have said the wound having been well and expeditiously washed, the mouth should be applied and suction vigorously carried on, and prolonged according to the virulence of the poison of the snake that has inflicted the wound, for one, two, and even three hours, without ceasing, by relays of people, who are to be directed to spit out what they draw into their mouth. While upon this part of the subject, it may be as well to mention, for general information, (as I am aware that a contrary idea is prevalent, and, indeed, it is natural that it should be so) that the virus of a snake, however deadly, when injected through the skin, by means of its tubular fang, is harmless, even when swallowed and taken into the stomach. The only danger to be apprehended by the suction of the poison into the mouth, being, the chance of an abrasion of the gums. This fact cannot attain too great publicity, as it will remove the objections of bystanders to render that assistance, which if they considered dangerous to themselves, they naturally would refuse to afford.

With regard to the process itself, that of continued suction by the mouth, I feel I cannot say too much in its favour, as I consider that if it is had recourse to in *time*, even in the absence of scarifying and washing the puncture, not one death in a hundred would occur from snake bite, while from its easiness of attainment, and simplicity in the mode of using, it is within the reach of all. In the first place the virus is directly abstracted from the wound, while, at the same time, pressure is made around it by the action of the lips during the process of suction, preventing the absorbents from taking up the poison, and conveying it into the system; two important objects being thus at once attained.

So much value do I place upon what I thus advocate, that when bitten by a whip snake myself, some years since, above the heel, and being asked by two friends who were present, what should be done, I told them, saying that I could not get at the place myself to apply my mouth to it. They, however, at once offered their kind assistance, and continued in relieving each other for upwards of two hours, to which, under Providence, I consider I am indebted for my life. I observe that this continued suction causes, after a time, great pain to the patient, and probably he will (as I did) beg that it may be put a stop to; no attention, however, should be paid to this, it should be continued for a time, as I have already mentioned, dependent upon the virulence of the poison possessed by the snake that inflicted the wound, and the length of time that has elapsed from the time of being bitten, before it has been commenced. In conclusion I have only to add that diffusible stimulants should from time to time be administered, the quantity of which will depend upon the state of the pulse; and the attention of the wounded person is to be kept excited as much as possible, and every means, even that of making him run about, being used to prevent him from falling asleep for some hours after he has been bitten.

The Academy of Sciences of Paris, December 5th, 1854, speaks in the most favourable terms of a paper read by Dr. Brainerd, President of the Rush Medical College of Chicago, on the treatment of bites of enormous serpents. He caused pigeons to be bitten by the *crotalopherus trigeminus*, and saved them by injecting solutions of lactate of iron and iodine of potassium—both electro-positive salts—into the wounds. Now it is an undeniable fact that "prevention is always better than cure," and whoever, therefore, discovers the means of shielding from any of the physical and moral evils that afflict humanity, merits better the gratitude of his fellow-men, than he who points out to us a certain cure. Here philosophy and benevolence go hand in hand, impelled, doubtless, by a similar idea. Serving out quinine in wine to our gallant sailors, who expose their lives on the swampy regions of the West Coast of Africa, to put an end to that chronic evil, the African slave trade, has, with scarcely any exceptions, prevented attacks of fever; on the contrary all those who refused to take this *preventive* medicine were affected by the *malaria*, and some died. A similar plan is adopted by the native snake doctors and catchers, they keep the system saturated with some bitter decoction, preferring, I believe, certain species of aristolochia, guaco, and cedron. However, this is a very disagreeable alternative by which to purchase immunity from an accident which, after all, may never befall us, besides affecting more or less the healthy state of him who would submit to being cured beforehand, as they style the process. A correspondent in Chiriqui, says, "The following anecdote, related to me by a very intelligent native here, would point out to us a better mode of investigation. A large snake of the most venomous kind was caught in a hen roost, trying to steal the eggs on which a hen was sitting, after having killed the hen, whose cackling had betrayed the thief. The farmer having heard from the Indians of the repugnance which these reptiles have for an alligator's tooth, had one brought and tied round a hen's neck, and thus thrown to the snake; it remained unhurt. The fowl was again taken up and the tooth removed; when thus thrown in the reach of the snake, it "immediately bit, and the bite, of course, was mortal. The experiment was again repeated with the same results." I have often been informed that a reptile's tooth presented to a snake has a sort of magnetic influence over it, causing the snake, even when irritated, to become as if torpid. It is a common assertion among the country people that the presence of a pregnant woman has a somewhat similar effect. Now, as to the *modus operandi* of the former, we can only suppose it is owing to the negative or non-electric condition of the fangs, which when rubbed attracts light substances, just in the same way that amber does. That poisons introduced into the body act more or less by disturbing the electro-vital electricity which exists in the state of health, we have a confirmation in the experiment of Dr. Page, of Valparaiso, who employed the electro-magnetic battery to resist the prostration ensuing from large doses of opium. M. Duclos has also shown that the tetanic symptoms produced by overdoses of strychnine are relieved by *negative* and rendered worse by positive electricity. The cedron having more or less a principal similar if not identical with strychnine, must, therefore, be useful in snake bites from its positive exciting qualities. However, what we ask from science is rather the *amulet* to protect than the means of cure, which, though certain, can only be after immense suffering and danger. Having thrown out the suggestion like "bread on the waters," I hope some of your scientific benevolent readers will be enabled to confer so useful a boon upon the industrious emigrant and others, who go to bring new lands within the domain of cultivation.

The point of the Bushman's arrow is saturated with a deadly poison, supposed to be made of the venom of snakes mixed with the milky juice of the Euphorbia and of some poisonous bulb. As a prevention against the ill effects of venomous snakes, many of the Hottentots and Bushmen swallow the venom of these reptiles with the view of saturating their system with it, and so rendering any casual introduction of the same venom innoxious. The curative means they adopt for venomous bites and poisoned wounds, consist of internal and topical use of snake root, the outer bark of which possesses a slightly sweetish taste, the fibres of the wood being yellow, and imparting an acid and somewhat hot flavour.

The mode of using this remedy is by the wounded person chewing a portion of the root until it becomes a pulpy mass, and swallowing the saliva to produce nausea. The wound is also washed with some of the saliva, and the pulp bound upon the part. This is frequently repeated until the patient is out of danger. The most implicit faith appears to be placed in this remedy.

Dr. Orpen, of Colesburg, Cape of Good Hope, tells us that though the full introduction of the poison into the blood will kill in a few hours, yet it can be sucked into the mouth, either of the person bitten, or of another, and even swallowed, with perfect impunity. This, all the Bush people know well and practise. Secondly, if it be possible, from the position of the wound, as on the fingers, toes, arms, or legs, they should tie at once on receiving the wound, a cord of some kind round the part above the wound, very tightly, twisting it with a stick, so as to prevent wholly, or at least diminish the quantity of the poison that can be carried by the veins towards the heart, and into the general circulation. Let the person who sucks the wound continue to do so, spitting out, if he chooses, as most will, whatever he can extract of blood or poison, until he can suck out no more; and if the wound be so situated that it does not bleed freely in sucking, it may be advisable to enlarge it, by a simple cut with a knife, which almost every one carries, so as to make more blood flow out under the suction. If the wound be so placed that it can be cauterised with a red-hot iron, or with any powerful caustic, let this be done to its whole depth, as soon after the tying of the handkerchief (or cord) and completed sucking, as possible.

It is said, that in India a small poultice of ipecacuanha powder is applied to the wound efficaciously, and it is also administered internally; so also are various preparations of ammonia (eau-de-luce, spirits of hartshorn, liquid and solid smelling salts), &c., &c. There can be no objection to try anything that either experience or theory shows to be really or probably useful; but all these things, as well as surgical instruments, are rarely at hand when the mischief occurs, or to be obtained until after all chance of escape from death is gone; whereas there will be always present the bitten person's own mouth to suck any part that his lips can reach, or commonly also some other person's mouth, to do the same office to parts out of his own reach; and at almost all times some kind of band, ligature, cord, handkerchief, &c., is within reach in a moment, and these two means, I believe, give more rational prospect of escape than all other measures united. I have been told, that the Bushmen harden themselves gradually against the effects of the bites of poisonous snakes, by drinking all sorts of animal and vegetable poisons, and say they have no fear of any such. Whether there be any truth in this story, or this boast, or efficacy in this practice, I cannot say, but I do not believe there is; because all such poisons, if they do not kill by their direct action on the stomach (which snake's poison will not, though many vegetable and mineral poisons will), must become so wholly altered, chemically, by digestion, as to have no effect when they reach the blood. It is certainly said in history, that Mithridates, King of Pontus, the great enemy and almost victor over the Romans, had hardened himself against all poisons, by the constant use of them; and there is a medicine called after his name, from this tradition; but the fact is as uncertain as a thousand others traditionally related.

At a meeting of the Medico-Chirurgical Society of Graham's Town (Cape Colony), held Sept. 25th, 1855, the President, Dr. Melvin, Inspector-General, quoted some experiments on snake-bites, which had been undertaken by a medical officer, solely for his own information and satisfaction:—

Experiment 1.—A large cobra de capella, of the yellow description, was induced to bite a full-grown dog in the neck, below the right ear. At the moment the animal was bitten he evinced much terror, and uttered a yell, but did not afterwards exhibit any symptoms indicative of suffering, except occasionally a slight twisting of the ear: after ten minutes the part appeared somewhat swollen, and the dog became lethargic; at the expiration of eight minutes longer he was seized with universal tremor, after which he lay down, and could not be induced again to resume the standing posture. When placed on his legs his nose always rested on the ground, he being unable to raise his head, the extensor muscles of the neck having to all appearance lost their power; and this defect of muscular energy gradually pervaded the whole body; he lay for some time in a state of coma, but at the expiration of 30 minutes from the infliction of the wound he was seized with strong convulsions of the body, his eyes being open and fixed. The paroxysms returned at short intervals during fifteen minutes, when, at the termination of one, he expired, making a total of forty-five minutes from the moment he was bitten. On examination, immediately after death, there was evident tumefaction around the wound, the cellular membrane being filled with serous fluid of a dark colour, which also could be traced downwards along the course of the absorbents in the neck; the venous system was loaded with blood, which appeared to be attenuated, and retained its fluidity during many hours. Except turgescence of the vessels of the brain and lungs, particularly of the veins, there was not any morbid change in the vital organs observable.

Experiment 2.—Two days after the above experiment was made, the snake bit a full-grown dog in the shoulder. The same indications of terror and pain as in the foregoing instance were afforded, and afterwards the animal did not evince any uneasiness or annoyance from the wound. Five minutes were permitted to elapse, when a portion of the integuments and subjacent parts, to the distance of two inches round the bite, was removed, after which he was allowed to lick the surface. The dog was kept up until the following day, when, not having shown any symptoms of being affected by the venom, he was released, and he became perfectly well.

On examining a portion of the integument which had been excised, appearances similar to those remarked in the former experiment were observed to extend round the bite. As a corroborative proof that the cobra had sufficient energy and virus to infect this dog, the third experiment was practised by causing it immediately to fasten on a cat, which died in fifty-six mintes afterwards, having symptoms and appearances, on dissection, exactly similar to those detailed in the first case.

Experiment 4.—In order to try the efficacy of the "snake root," a full-sized bastard cobra was induced to fasten on a dog at the lower part of the neck. After a lapse of five minutes a strong infusion of the root was poured down his throat until vomiting was produced, and this was thrice repeated; the wound was washed with it, and some of the bruised root was bound on the part. At the expiration of twenty minutes, the animal became restless and whined; soon after, a lethargic insensibility seized him: convulsions supervened and terminated in death, in little more than an hour from the infliction of the bite. The *post-mortem* appearances in this case were similar to those already described, the effusion of serum around the wound being rather more copious than in former instances.

In two instances, the experiment of excision was tried. In one, seven minutes were allowed to elapse previous to the operation; and in the second, the part was not excised before a quarter of an hour had elapsed. The former of these cases terminated favourably; but in the other the same result followed as if no curative means had been adopted.

From a due consideration of the several experiments quoted by Dr. Melvin, he is inclined to regard excision of the part bitten by a venomous reptile as the surest means to be adopted to save the sufferer's life; and the operation should not be delayed beyond ten minutes after the infliction of the wound. Suction by the mouth is a well-known remedy, and the readiest which can be adopted, and will arrest the absorption of the virus for a time, but it is doubtful that it would remove the whole of the poison: it would lessen the quantity, however, and make what remained less noxious. The application of cupping glasses would be more powerful and efficient; but at a distance from a house such articles could not be procured. Under such circumstances, the writer thinks that suction, and the application of a ligature immediately above the bite, would be the readiest and only means to be adopted, until excision could be effected. Stimulants are of great use, particularly the carbonate of ammonia. Arsenic has also been used with success.

Mr. Theobald, an apothecary of Kamptee, Madras, publishes what he considers an effectual remedy for the sting of the scorpion, which is the juice of the *Achyranthes aspera*, a plant common everywhere in India. He states, "My daughter was three years of age when she was stung in one of her hands by a scorpion, as she attempted to catch it as it was crossing her, and only her mother, who was present, noticed the occurrence accidentally: the little sufferer could not point out where the sting was, and her incessant screams were so great that I was fearful of her falling into convulsions if she was not immediately relieved. Having lost the prospect of touching the affected part with nitric acid, for want of knowing the exact situation of the sting; and the awful consequences that might follow if her hands were besmeared with a destructive fluid, led me to resort to something that I should not feel regret for having adopted. The fresh leaves of the plant named were bruised and applied all over the fore arm, and about a table spoonful of the juice given internally. This had the desired effect in arresting the pain in a very short time. He subsequently tried the remedy on his gardener with equal success.

Mr. W. J. Carter, clerk of the Church of Kamptee, also publishes a letter notifying the efficacy of the remedy in the case of a child of his stung by a scorpion. The leaves were pounded, three spoonfuls of the juice were given internally, and from the uncertainty as to which foot was stung, the juice was also applied to both feet up to the knees. The child was relieved in a quarter of an hour.

Another correspondent suggests as an effectual remedy well rubbing the part affected before the fire with gingely oil (Sesame).

The cure resorted to in New South Wales is to take a pinch of salts of hartshorn, and put it on the bite, then apply a few drops of nitric acid, which may be removed in a few minutes if it does not succeed in relieving the pain.

The following hints, given in the *Cape Almanac*, are worth attending to, as summarising in brief much of the advice given already:—

"In the event of a person being bit by a snake, no time should be lost in applying the proper remedies. The indications of cure should be three—1st, In preventing the poison entering into the constitution of the body; 2nd, The withdrawing or destroying the poison in the wound; 3rd, The counteracting its baneful effects when it has entered the system.—The first of these is to be effected by tying a very tight ligature, or garter twisted with a stick, above the wound about five or six inches, or over the first joint of the limbs; by these means the poisonous liquid may be prevented entering the circulation.

"The second indication is that of applying topical remedies to the wound, either by the application of one's own mouth, or that of an assistant, for the purpose of withdrawing, by strong suction, as much of the poison from the wound as can be effected, and which will do no injury, either to the mouth or stomach of a person if swallowed; after which eau de luce, nitric or sulphuric acid, water of ammonia, or sal volatile, should be dropped into the wound as freely as possible, and the recess washed as completely out with it as can be accomplished.

"The third indication is to be effected by exhibiting internally a tea-spoonful of eau de luce, water of ammonia, or sal volatile, in half a glass of cold water, every five minutes, to create a strong and artificial stimulus, and thus to remove the languor and lethargy that immediately succeed the bite; further, by rubbing hartshorn on the temples and nostrils, by employing bleeding and electricity, and occasionally brandy, both externally and internally, with frictions of salt, and increased temperature of heat and blankets; all those exciting means should be employed until the patient recovers, or until no further hopes are entertained of his recovery. The great object of these applications is to support the *vis vitæ*, or power of life, until the constitution, either by its own energy, has overcome the effects of the imbibed poison, or the remedies exhibited, by mingling with it in the puncture, or meeting it in the circulation, may render it, by decomposition, inert or harmless. In discontinuing the remedies that have been recommended, a course of gradual diminution should be pursued, as they are apt to occasion, by their effects, a considerable degree of debility."

In a paper on the medicinal properties of the *Mitanca Guaco*, which I published in the *Pharmaceutical Journal* a few years ago (vol. 10, p. 534), I cited various authorities as to its preventive virtues against all poisons. The celebrated Mutis, of Santa Fe, first made known its properties as an antidote against the bite of certain serpents, and Humboldt and Bompland have confirmed the powerful virtues of the plant. M. Mutis was desirous of ascertaining if inoculation with the guaco would render a person obnoxious to the bite of serpents for a lengthened period, but was prevented from completing his experiments by the refusal of the Grand Court of Justice at Santa Fe, to allow him to make them on criminals condemned to death. The negroes who wish to protect themselves against snakes bites take the following precautions:—They make two incisions on the feet, two on the hands, and one on each side of the chest. They express the juice of the leaves of the guaco, which they pour on the incision, as if inoculating. Before the operation they make the patient drink two spoonfuls of the juice, and they recommend his doing the same five or six times a month to continue the virtues. One of the leaves of the plant is usually carried about the person, and the strong penetrating and venomous odour is said to have stupifying effect on the reptiles. [Alibert's New Elements of Therapeutics, p. 500.]

A very valuable paper by Capt. Munro, F.L.S., was published in the first part of the 6th vol. of the Journal of the Agricultural and Horticultural Society of India, on the antidotes to snake bites. The set of this Indian journal is in the Society's library. I transcribed the paper in full in my *Colonial Magazine*, Vol. XIII., p. 377. It is too long to be given here, but I will make an abstract of those parts specially relating to vegetable antidotes.

For many years past different remedies have been proposed in India as infallible ones, by men in several instances, entitled to full credit for completeness in carrying on their experiments, and possessed of a sufficient knowledge of the subject to render their assertions worthy of all belief and attention. Some of these remedies have, however, been tried by others equally capable of giving an opinion and found to fail.

I find these remarks have already extended to such length that I must defer the conclusion until a future number.

MEN AND MANUFACTURES IN THE UNITED STATES.

By W. Bridges Adams.

The object for which the Society of Arts was incorporated was "generally to assist in the advancement, development, and practical application of every department of science in connexion with the arts, manufactures, and commerce of the country."

Therefore, to know and understand the country and people with which and whom we have the largest commercial intercourse, is an important element in the operations of the Society.

We have been in the habit of considering and calling the people of the United States, Transatlantic Englishmen, because they were once our colonies. This alone, cannot make them Englishmen, in any other sense than that they use the English tongue, and have inherited many of the old English laws. Much more than this goes to the making of Englishmen—the quality and staple of manhood that originated those laws and that language, and continues to make spontaneous additions to them. We, and the original ruling people of the United States, who threw off the yoke of slavery sought to be imposed on white men, started from the same point. It would be ethnologically desirable to know what proportion of native born Englishmen and of native born Americans did the work at Bunker and elsewhere with mind and body. A difficult thing now to ascertain. But we can form some comparison as to how far Englishmen and Americans, starting from the same point, have kept parallel paths, and continue to resemble each other in laws, manners, and customs, physical appearance and bodily strength, as well as mental vigour; and if differences have grown up, we can try to analyse the causes of the difference.

The older naturalists, De Pauw and Buffon, writing at some period after the discovery of America, asserted that the new world produced both men and animals inferior to the European continent, and American philosophers contested the point. The European side of the argument was based on the fact that the larger European quadrupeds did not exist at the time of the conquest, and that the tribes of red men, whether by reason of inferior intellect or inferior bodily strength, or inferior industrial energy, were universally vanquished by the whites of Europe, whether coming from Spain, or France, or England, Portugal, or Holland.

Of these facts there could be no doubt; but the superiority of the Europeans might arise from superior and abundant means and appliances long known and practised. The Europeans might have passed through the phases in which they found the red men to exist; not a nation, but an aggregate of hunting tribes, who living, by the chase, when game became scarce, and population grew to a surplus, knew of no better remedy than slaughtering one another in war, with hereditary feuds, till their numbers were thinned down. A people taking no thought for the morrow, but not in the spirit of Christianity, and when the morrow came, seeking their food, if hungry, by the same processes as the wild beasts. Still this did not prove them to be either better or worse than Europeans might have been in some past age—they might be a younger nation, not come to their full growth.

But it is certain that from north to south, and from east to west, they possessed, with variations, one general physiognomy, whether as tall men in Patagonia, or as dwarfs in Peru, and moreover, that physiognomy, as evinced by the Aztec children lately exhibited, bore a strong resemblance to the Assyrians lately dug up by Mr. Layard. Be it what it might, there was assuredly some cause at work to produce this physiognomy, and that cause has not yet ceased to operate. It is probably a cognate cause to that which produces black men in Africa; Hindoos in India—thin and wiry and olive-coloured; Dutchmen in Holland—obese and fair and lymphatic; Frenchmen in France—mercurial and belligerent, but toned down in Canada, and mingling freely with the red women, shunned by the English race; Irishmen in Ireland, with every tone of the voice an aspiration; Englishmen growing "more Irish than the Irish" within the "Pale," and Englishmen as they are and have been for ages, merging all foreign blood into their own peculiar form and temperament. It is not race that does all this, but something else. Races coming to England grow into Englishmen; Englishmen going to the United States grow into Americans. In India or the Antilles, though not Creoles born, they grow to resemble Creoles, and their descendants in Barbadoes, who boast of being neither "crab nor Creole, but true Bajuns born," have assuredly little trace of the Englishman left, save a deteriorated mother tongue.

The ancient Puritans of Massachusets, albeit calling themselves Christians, invariably spelt the word *indian* without a capital letter, as something not human. Cooper and others have sought to chivalrise them to make up for it, but all the horses descended from Morocco barbs or Spanish *ginetes*, and stolen from Mexico to mount the Red men as Crows or Blackfeet, have failed to produce a Herbert or a Bayard. The churl by blood cannot grow up to knighthood without much crossing.

One of the best and clearest-brained men of America in the present day—one of the few to whom the revolutionary virtue and valour has descended—and who makes outward and visible signs thereof, Ralph Waldo Emerson, has visited us, talked to us, lectured to us, and written a book about us. He says in his book, "The Methodists have acquired a face, the Quakers a face, the Nuns a face."

True, all this. And even thus the Americans have acquired a face which very moderate perceptive faculties can pick out. This face Emerson himself possesses. It is a face suggestive of the red indigenous races of America, not of copper tinge, but sallow, indigenous in expression, indicative of melancholy temperament and nervous anxiety, a face which, notwithstanding, when brought into England, and acclimated during the term of an indenture of apprenticeship, changes its colour and becomes from sallow a healthy florid red. And *vice versa*, the healthy florid Englishman, taking up his abode in New York for a like seven years, becomes sallow, and acquires American characteristics when not counteracted by frequent sea-going. In Englishmen, hilarity is a constant quality. An American so rarely laughs that it is an object of instant remark by a stranger, "The laughers in New York are Irish." Englishmen get drunk. Americans drink drams, and invent names for them without end. Englishmen smoke pipes. Americans chew tobacco. Englishmen, between life and death, average 25 per cent. more working days than Americans, making a serious difference in the national capital invested in their "raising." Englishmen eat as a healthy pleasure; Americans as a matter of imperative business, to be rapidly done. Englishmen have an innate respect for law and order. Americans obey or break the law as best suits their impulses. Americans bush-fight with the rifle, as do the Indians. Englishmen stand up in phalanx, in "thin red line." The mind of the Englishman finds intervals of calm and enjoyment; the mind of the American is in a condition of constant fever—incessant strife—with intervals of prostration needing stimulus in "bitters and cocktails," which are effects not causes, and the fire-water to which the red races succumb is but the Indian version of the "juleps and slings" of the descendants of the imported white man.

The Americans are not a nation, not an indigenous growth of men. Since their revolution and before, America has been the recipient of people the surplus growth of all countries. They are an aggregated mass, living under laws as various as their separate States, and only held together by a general government, which they submit to more or less as it suits them. We cannot verify, we can only speculate on what they would have been had immigration ceased with the revolution. Looking at the fact that boys leave their families and set up for themselves "on their own hook" at 15 years of age, and that the tomb-stones in New York diminish the "threescore and ten" of English life down to something like 45 and 50, we are constrained to suppose that soil and climate, marshy lands and hot summers, and cold winters, produce a hot-house growth of man, soon ripe, and quickly decayed.

That the American Union has made rapid progress in physical possession there can be no doubt. But food has been easy of acquisition, much easier than in England, and therefore there ought to be less recklessness of life. But the contrary is the case. Scarcely any people appear to be so reckless of life as the Americans. The Southern duels, and the Missisippi steam-boat drownings, and the barbarous deeds of Kansas, savour of people who feel life to be a weariness. In New Orleans it is said that to carry on business requires three partners—one to be killed in a duel, another to die of disease, and the third to pack up and carry off the plunder. And, again, they say that a man cannot well understand mercantile business till he has been three times broken up. Then States repudiate their debts, and it will be found that the repudiators are most common where the standard of life is lowest.

Englishmen are not remarkable for recklessness of life; they are ready to expend it for a great object, but not to throw it away in brawls. There was a period in English history—the plagues of London—when uncertainty of life begat recklessness of life, but it did not become perennial as in the United States.

But America does exhibit an outward energy in railways, ships, and manufactures, in commerce and invasion of neighbouring States, not national wars, but wars in which the surplus energy of the community can expend itself excitably if not profitably. In what class of people does this energy reside? In the native-born or in the imported races. There are American people on the northern seaboard of the Atlantic, who are very like Englishmen in their attributes, and it is quite clear that they make fast-sailing ships, stimulated by various circumstances, which heretofore, under the old navigation laws, Englishmen were lacking in, but the men who do these things are of the same staple as Englishmen; they have not deteriorated, on a Western bank of the Atlantic, from what their forefathers were on an Eastern.

"Through storm and wave and blinding mist, stout are the hearts which man
The fishing-smacks of Marblehead, the sea-boats of Cape Ann."

They invent, and so do Englishmen; but they have had a 'vantage-ground denied long to Englishmen. They had no impedimental laws of partnership, divorcing the brain and the purse; and for seven pounds sterling the inventor had his protection. They had no excise on glass, and they made imitation cut glass for half-a-century without an excise law to crush them; but it was Englishmen who made the first Crystal Palace for Americans to imitate, when the excise incubus was shaken off. They have excelled England in inventions in mechanical appliances to save farm and domestic labour—they have invented reaping machines, and washing machines, and apple parers, and wood-cutting and gun-making machinery, but all this was forced on them because wages were high and labour scarce. At works of necessity they are acute and striving; but for works of neatness they have little industry, and, considering their abundance of building material and comparative wealth, they are generally an exceedingly ill-lodged people.

Emerson says in his book, "The English, at the present day, have great vigour of body and endurance. Other countrymen look slight and undersized beside them, and invalids. They are bigger men than the

Americans. I suppose a hundred Englishmen, taken at random out of the street, would weigh a fourth more than so many Americans."

The artisans and seamen of the United States are, no doubt, native as well as imported. But who are the Fillibusters; and of whom were the rank and file composed who followed American leaders in the Mexican raid or razzia, first planned, years back, by Aaron Burr, at Blennerhassets Island, in the Mississippi, but failing for lack of men and means, and serving his opponents as an excuse to accuse him of treason against the United States Government? Who are the Fillibusters—the men who join Walker in Nicaragua, and are ready to descend upon Cuba when the time shall come? Of a surety they are not Americans, but the same staple as that root of which grew the bucaniers, the broken men of Europe, with a scattering of "mean whites," men who may not work in the South, even were they disposed. Such men cannot be permanent—cannot make an American nation. They can only live in riot and excess; and, if unsuccessful, they will only die off a little more rapidly than if successful, of cholera and yellow and other fevers, more fatal than the Spanish knife.

That slave-owners should seek to retain their slaves, is not remarkable. Our own West India proprietors did the same, save those who profited by the compensation. American slaveholders are not worse than English. But it is a remarkable thing that the slaveholders should keep those who call themselves freemen in bondage—should dictate all the laws. In numbers, the North would seem capable of walking over the South without impediment; and the evils of slavery to the white man are apparently greater than to the blacks. How is it that the North submits? Where is the ancient courage that should proclain as with a trumpet voice—

> "No slave-hunt on our borders—no pirate on our strand—
> No fetters in our Free States—no slave upon our land."

Creeping northward comes the Black Death; and bravely calls out Ralph Waldo Emerson for "committees in permanence." Has the physical vigour run out? With the 25 per cent. lost in weight has 25 per cent. of the mental impulse, the security for honest labour, gone out also?

And whence comes the Southern strength? Has their physical vigour preserved itself while the North has failed; or is there a stronger infusion of European vigour imparted? Do men of the Mitchell and Meagher stamp swell their ranks? Is it that the men of the South are simply landlords, gathering rent, and with ample leisure, while Northern merchants and manufacturers have their thoughts incessantly bent on their desks and workshops, and cannot put their minds into the public service? I would fain it were so, for there would be hope in that; but if it be loss of manly vigour, the days of American greatness are numbered, and only an Asiatic despotism remains, a slave empire, to be absorbed by Russia, or upheld by England and her northern provinces, as is the case with Turkey.

Wheat has, a short time back, been brought direct by ship, without transference of cargo, from the heart of the American corn-growing country into Liverpool harbour. An important fact, which may or may not be followed by successful repetitions, the perils of Anticosti, and Newfoundland fogs, and Atlantic icebergs notwithstanding. There may grow a trade of carrying out English and other agriculturists, and getting return cargoes of wheat from our outlying farms in Michigan, Wisconsin, and Illinois. But we should like to know whether the corn growers deteriorate in the land of lakes and swamps, and fever and ague; whether they most resemble the men of Kent, or the semi-aquatic tribes of Cambridgeshire; whether web-footed like Hollanders, or apple-cheeked like our South Saxons, or eagle-eyed, like the men from the ridges of Yorkshire and Lancashire? Can they live a long life in a state of healthy enjoyment, and with only occasional drunken bouts, without the diurnal chewing of tobacco, or the imbibition of juleps and gin-slings? One very remarkable habit exists in Americans. Many of them, of most vigorous faculties, emigrate to England, as though the soil and climate were more indigenous to them. Their manufacturing faculty settles down with a Dyer at Manchester. Their banking faculty comes over with a Peabody, with a Hobbs to make the strong boxes, and a Colt to make revolvers to guard them. Their very thieves teach us new modes of plundering hotel guests; and we have their "men about town," knowing everybody and everything, and the sources of their income a mystery to all their acquaintance. All these men recognise their most fitting locality, the soil of elastic health. But it is clear that the great source of American prosperity has been in her large annual importation of full-grown producers, without the cost of transit or "raising." Does she possess the elements for continuing the supply of healthy producers, if by any chance immigration shall cease?

Nothing exists on the earth's surface more beautiful than the form of girlhood in the New England States—Hiram Power's Greek Slave is a type of it. But that beauty partakes of the etiolated attributes of many of our over-delicate and refined English women, born to do no manner of work, and physically cultivated like hot-house plants.

Glad should I be if Emerson could demonstrate satisfactorily that the Anglo-Saxon race does not physically degenerate in the Union; that it holds its own, and does not merely multiply like deteriorated factory workers, but that it increases in mental and physical power. Much may doubtless be done by careful treatment to counteract the effects of climate, but man, like trees and plants, is ever racy of the soil. Soils and climates will grow men with their own attributes, and the question is, whether, by man's care, the soil and climate of the Union can be generally modified so as to grow Englishmen in all their natural vigour, modified in numerous and sufficient localities to give a healthy and vigorous mental and physical frame and tone to the general people, qualities which constitute a nation, and not a mere aggregation of human units.

Time was that the world looked to America as a young giant nursed in the lap of freedom. But that dream is dreamed out, if it be that the delegated lawgivers are true samples of the aggregate staple; if it be that the general faces of America truly represent the general mind of the Union. The instinct of a tricky commerce overlays all the national honour of America—overlaid the chivalrous instinct of freedom during the late war. There was no heart-gush in the general American press, such as would have been the universal impulse of the English press, had it fallen to the lot of America to resist Russian oppression.

It may be that certain portions of the earth's surface are predestined for the growth of the guiders of men, and other portions for their followers; and very gladly would I receive the demonstration that the general American people within the Union belong to the former class, by finding heroic speech the precursor of heroic deed, worthy of all our old and high traditions, arts devoted to human progress, and arms ever wielded in the cause of freedom and the growth of soul.

As a part of the duties of the Society of Arts, it is well to understand that the *manus* comes before the *facture*, and that man, the owner of the "manus," is still more important than the materials he work on, that he, so far as his body is concerned, is a production of the earth, as much as the trees, plants, or lower animals, and of that earth, and its gaseous exhalations, he must be formed and will be formed well or ill accordingly. If he lives where lime is not, he will have gristles, but no bone. If he breathes sulphuretted hydrogen, he will not digest his food. If he has insufficent food, he will neither have mental nor physical strength, and if he has too much food he will degenerate, as well as if he is confined to one kind of food. To cultivate the mind which a healthy body is competent to maintain, he must be in a position to obtain knowledge and look on beauty in all its varied forms of nature in early life, and of art in later life. The possessor of these things will have health, wealth, —weal,—and a large aggregation of such men and women, will constitute a powerful nation. The absence of these things is poverty, and it must ever be a dependent nation where there are many poor but few rich. The chiefs and leaders, or the state, may advantageously possess enormous wealth, but they should be careful also, so far as possible, to extinguish poverty in the community, from whatever source arising. They should not permit dwellings to be erected in unwholesome localities, and, where erected, they should remove them by Act of Parliament. They should not divide a city into quarters, separating classes and ranks of people ; but, on the contrary, should endeavour to mix people of all ranks, not in personal contact, but in mutual supervision, so that the coarse would grow refined, and the refined be (or become) humane, beholding and relieving suffering, or, better still, preventing it. The wealthy, either personally or pecuniarily, would thus become the natural chiefs and leaders of their neighbours. The city circles would be as much bound up as the rural villages. The cities are the centres, the ganglions of intellect ; there is no reason why they should not become also the centres of the higher moral virtues. That they are centres of vice is not a necessity, but simply a neglect. Wherever there is a natural gathering of people, there also is a natural centre of instruction. The love of popularity is a very common quality, and it is strange that so very obvious a source of popularity should be so generally neglected. Let the cities be made, as they are capable of being made, pleasant abodes, and the wealthy will flock to them instead of away from them, and a new era may commence. It is clear that a Society of Arts could not flourish in a rural village ; and it is clear also that many people do not attend the meetings, because they do not and cannot live in town under its present conditions. There is work enough for the Society of Arts to aid in removing those conditions, by the improvement of humanity, and all that constitutes the growth of humanity.

DEFICIENCY IN THE MADEIRA AND PORT VINTAGES.

The following information on this subject is quoted from a trade circular lately issued by Mr. T. J. Smith, of Oporto :—

" In order to the better understanding of the present anomalous state of the port wine trade, owing to the ravages of the *Oïdium*, it may be convenient to trace the course and exhibit the effects of that scourge of the vineyard, from its first appearance at Madeira in the year 1851.

	Pipes.
From the year 1847 to 1850 the annual produce of that island *averaged*	16,915
In 1851 it was reduced by the disease to......	11,965
1852	1,871
1853	754
1854	187
1855 the vintage was annihilated, producing only	29

" The disease appeared in the Upper Douro in the year 1853, increasing in virulence to the present year, and showing results as fatal as those at Madeira ; the port vintage of 1856 being wholly lost to commerce, producing, with the addition of water, only four thousand pipes of a liquid fit only for the meanest purposes of local consumption.

" From the year 1846 to 1852, the annual produce of the Upper Douro *averaged* 91,533 pipes, after which, from the appearance and spread of the mysterious disease, the produce rapidly declined, the *deficiency* from the average growth being in the year

	Pipes.
1853, according to official returns.........	16,745
1854	44,285
1855	66,758
1856, estimated at	87,532
Showing the defalcation of the last four years to be no less than	215,320

" This enormous deficiency fully accounts for the advance in the price of both wine and brandy at Oporto ; that on wine being two hundred and fifty per cent., and on brandy six hundred per cent., since the year 1848.

" Meanwhile, the shipping prices have borne no sort of proportion to the advanced rates which have been established, and must be submitted to at Villa Nova, now the only source of supply, where the stock of merchantable wines is so reduced as to render a large advance on every variety of *genuine* ports an inevitable necessity. Indeed, fine old wines are become so scarce and costly, as to justify the expectation that their price may soon be doubled, as it will require a length of years to create a fresh supply, even after the disease that infests the vineyards should have passed off."

Home Correspondence.

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METROPOLITAN SEWAGE.

Sir,—Permit me to say a few words on the sewage question, which I have been led to study from two circumstances. The first was, that residing for some time on the banks of the Thames, in the heart of the City, I was perpetually hearing the remark, " How that scuttle is tarnished, although it was well cleaned yesterday," until, at length, my copper friend was obliged to be greased and stored away. Thinking this matter over, I placed within and without doors, with due precaution, some acetate of lead, and soon found that both specimens became discoloured, and gradually assumed a dark-brown hue. Sulphuretted hydrogen had done this, and I could not avoid the conclusion that the gas so prejudicial to my scuttle, was not very healthy for human beings, and the idea has ever since haunted me, as I walk the streets, and see the pallid children ; and I find myself involuntarily exclaiming, " Tarnished lungs and blood."

Again, I had not visited Richmond for many years, until last summer, when, to my extreme astonishment, I found that the clear and bright pleasant river of my boyhood had become a thick churning pool of filth, and with sorrow I retreated towards the park.

Regard to your space will not allow of more than the general principles and bearings of the subject being treated of in this communication.

1. As there never before existed, within so small an area as is covered by London, a population numbering upwards of two millions, it may be safely asserted that the drainage of the metropolis is the most important domestic sanitary question with which any community ever had to grapple.

2. That the Government is incompetent to undertake the matter, is evident from the utter and miserable failure of its attempts to sustain a small army, as soon as the wretched beings were placed at a distance, and in circumstances which required that judgment and forethought should take the place of routine and wasteful extravagance. Nor has the administrative capacity of the Government improved, otherwise the reckless manner in which new unused stores, provided at an enormous ex-

pense, are being disposed of would not be permitted; therefore, the pettish authoritative tone assumed by Sir B. Hall, in his intercourse with the Board of Works, is unbecoming, until the Government can give a better account of its own performances.

3. Nor does the Metropolitan Board of Works appear to be composed of "the right men in the right place;" for, with all good feeling to individuals, it cannot be expected that men who have been engaged in the details of retail business all their lives should be conversant with a great question in which the points to be decided are of a chemical and engineering character; and from this circumstance we may attribute the fact that the sittings of the Board have been occupied either with discussions relating to subordinate matters quite apart from the great object of its appointment, or have assumed the form of stormy advocacy of "my friend" This or That's scheme.

Hence, also, the Board has been driven to the somewhat ridiculous position of submitting to the Government for approval a scheme which had been twice rejected by its own votes.

4. Let us endeavour to place the matter clearly before us. What is required to be done? To remove from a dense population, occupying an area ten miles by six miles, certain inconveniences, viz.:—

A. Ordinary surface water, and extraordinary, as storm water.

B. Waste or refuse matter, as garbage of all kinds, washings of utensils, &c.

C. Solid excrement.

D. Liquid excretions.

The last three are tolerably uniform in the quantity produced; the first, however, being very variable in quantity, and sudden in its fall, provision must be made for its disposal at a maximum rate.

5. Of what do these matters consist, in a chemical point of view?

A. The garbage and solid excrement, being organic matter, are *resolvable* or *convertible* by the atmospheric air into ammonia, sulphur, and phosphorus compounds.

B. Alkaline (ammonia, potash, and soda) salts *already formed*, as in soap washings, liquid excretions, and *not* precipitable by lime.

C. Phosphates, chiefly in the liquid excretions, and which may be *decomposed* by lime, the phosphoric acid being *precipitated* in combination with the lime.

Hence the importance of bearing in mind in this discussion that we have to deal with *solid* matters *insoluble* in water, in the form in which they are found in the sewers, although *diffused* through a large quantity of water; and matters *dissolved* in the sewer water;—sand may be diffused—but sugar is dissolved in water, as are the ammoniacal salts.

We will now briefly touch upon the schemes which have been proposed to effect the desired object.

6. *The Deodorising Scheme.*—It is proposed to erect works at several points of the metropolis, for the purpose of deodorising the sewage, retaining the solid portion, supposed to be useful for agricultural purposes, and allowing the liquid portion to run off into the stream.

To this proposition several objections may be made.

A. Lime would precipitate a large proportion of the organic matter convertible into ammonia, &c., but not the richest portion of the sewage, viz., the alkaline and ammoniacal salts *existing* ready formed in the washings, liquid excretions, &c., before going into the sewers.

Assuming Mr. Lawes's analysis of the Leicester sewage bricks to be correct, we have 12 per cent. of organic matter thrown down, and less than 1 per cent. of ammonia, the most valuable portion for agricultural purposes, apparently passing on, unaffected by the lime; the water may appear clear and limpid, but this is because the salts of ammonia are *colourless*, and their presence is, therefore, not perceptible to the eye, and being very dilute, they may not affect the taste or smell, nevertheless, so far as this process is concerned, they escape, and are not rendered of value.

B. The impracticability of dealing conveniently with the immense mass of solid matter which the deodorising process necessitates.

Taking the Leicester case as a guide, it should be observed that, of so little value is the article produced, that, in the short space of 19 months, during which the works have been in operation, 3,000 tons of the produce have been accumulated in the yard of the establishment, which, although it may be commended for "emitting no smell whatever," yet, unfortunately for the theory, the fact that it is there at all only proves that it is not in good odour with agriculturists.

If with a population of 65,000 souls the rate of accumulation is 2,000 tons yearly, with a population of two millions and a half the enormous quantity of 80,000 tons yearly would accumulate an *embarras de richesses.* Of these bricks without straw we could build a pyramid annually.

C. On the deodorising principle, 160,000 tons of lime, it is estimated, would be required every year to be first conveyed to the works, and the resulting manufactured solid article carried away.

In my opinion, this would only be getting rid of one difficulty by introducing another not less serious.

7. *The Irrigation Scheme.*—To this plan two or three fatal objections exist.

A. The sewage is produced daily and hourly, but is only required upon the land intermittingly, at distant seasons, and the most sanguine could not hope to store it until the time of using should come round.

B. Moreover, to adopt the scheme implies arrangement for distribution, and an expensive outlay for pipes over a large district, which must be ready to receive it at all times, and to any extent, or the project is defective in one essential element of working.

Landowners do not appear satisfied that they would be compensated for the necessarily large expenditure; those who have the will may not have the means, and *vice versa;* and how it is to be made a compulsory matter I cannot perceive.

C. Nor have we sufficient evidence to justify the conclusion, that, although it may be advantageous to diffuse a solid manure through water and dilute a strong liquid manure to the degree which the farmer may deem proper according to the wet or dry state of his land, and in that condition apply it to the soil, therefore, it would be a right course or beneficial to flood the land round London with a dilute sewage in addition to the rain which at the very moment might have saturated the ground to the heart's content of the farmer.

The dilute sewage would, of course, come in rainy weather, and the drier the season the more concentrated would be the sewage, the degree of dilution being beyond control, and not optional with the user.

8. *The River Scheme.*—The following objections appear to exist to this project:—

A. Kent and Essex are the lungs of London, and if railway civilities and facilities were increased, they would daily become more populous.

It is another version of David and Uriah. With all its rich enjoyments and luxuries, London cannot devise a better plan for increasing its own comforts than by robbing the small towns and villages on the banks of the Thames of the only advantage they possess,—their one ewe lamb—pure air.

It is proposed to collect all the filth of London and deposit it in heaps at the doors of its weak neighbours.

B. Granting that the sewage would be conveyed so low down the river as not to return even to Gravesend, yet, as it would be discharged in large quantities, it would be thrown up on the shore at Southend, Herne Bay, Margate, and all along the district so much frequented by health seekers from London.

C. This scheme does not embrace any plan for utilising the sewage; it is at the best a rough mode of removing the nuisance into another locality.

9. As it is only by the thorough agitation and discussion of the subject that the truth can be arrived at, and having stated my objections to the existing proposals, I would suggest one or two points for the consideration of those who have accepted the responsibility of this matter; they receive the emoluments and honours of office, and much praise will accrue if the work be well done, and much blame if they do not succeed.

10. Without reference to cost the best plan for accomplishing the object should be clearly determined, for it is monstrous to suppose that a hundred millions should be thrown away in a war like the last, and that we ought to hesitate for money considerations as to the course to be adopted in a case like the one we are discussing, when once the right thing to be done is plainly laid down. A successful accomplishment of the great task would annually save thousands of valuable lives of all classes, and add materially to the pleasure and health of residents and visitors.

11. The best scheme being determined, the next subject of investigation should be the most economical mode of executing that effective plan.

12. Entertaining these views, I need scarcely say that distance is of secondary consideration, and although when I have spoken of the English Channel as an outlet, the idea has been rather laughingly received, I now find that Sir S. M. Peto proposes to convey the sewage to the German Ocean, a distance greater than any other yet proposed.

13. I differ from him, however, as to the direction in which the sewage should be taken, and its mode of treatment. I should prefer a southerly direction towards the channel, on account of the nature of the country, large tracts, both in Surrey and Sussex, being comparatively worthless, and also for the reasons which follow.

14. The whole of the sewage should be conveyed by covered sewers through Surrey and Sussex, avoiding every large town, if possible; and at the nearest convenient point to London, where waste land can be obtained at a very cheap rate, covered reservoirs should be constructed, each capable of containing the solid sewage of a week, in addition to the total sewage of a day; such reservoirs being so built that the bottom should be below the level of the sewers, the continuation or outlet sewer from the reservoirs being on such a level as might be found advisable, to clear the reservoir of the liquid sewage after settling.

Two reservoirs should be in operation at the same time; thus the pair of reservoirs Nos. 1 and 2 should work together. No. 1 receiving one day's sewage, which should then remain quiescent for 14 or 16 hours, the clear water running off during the last 8 or 10 hours of the second day, during which second day the sewage would be running into No. 2 reservoir, and so on alternately; thus, at the end of a fortnight, the contents of Nos. 1 and 2 reservoirs would be ready for pressure and removal, and the second pair would come into use, and so on in rotation.

The effect of this arrangement would be, that the solid matter would subside by its own gravitation, and the liquid flow onwards.

The outlet sewer should be guarded by strainers, to retain whatever solid matters had not deposited by gravitation.

The strainers might consist of double iron perforated plates, filled in with lumps of charcoal, which charcoal would absorb a large quantity of the soluble salts, and become a valuable manure; and it does not appear to me that these soluble salts could be so well secured in any other way.

Pairs of reservoirs being used in succession, one could be cleared out weekly; the deposit would be true guano, and might be subjected to hydraulic pressure, and in this compacted form could be transported by rail or canal to all parts of the country; there would be no 50 per cent. of lime to be brought to the works at a large expense, and, when added to the small quantity of fertilizing matter, greatly increasing the weight to be carried away.

Moreover, in the direction I have pointed out, any lime desirable for purifying the works or thinly covering the deposit in the reservoir, could be much more cheaply procured than in Essex.

The now cleansed water might be pumped up, if necessary, and discharged into some of the canals, with whose proprietors arrangements might be made for that purpose, or carried by special conduit to the sea.

All propositions should recognise the twofold character of the question, the chemical and the engineering. The treatment by subsidence, which I propose, is not necessarily connected with a discharge into the Channel, although obviously it could be carried out more cheaply and easily in a thinly-peopled than in a populous district.

In reference to the engineering portion of the subject, I may further remark that the necessity of pumping is admitted in all the plans proposed, and the arithmetical question for decision is, whether, after the arrival of the sewage in the southern part of the metropolis by the natural fall, the annual cost of raising it to such a level as would secure a sufficient fall to the Channel, would not be less than the interest on the outlay for the construction of main intercepting sewers, as on the river plan, or other of the proposed schemes?

For it should be observed that nearly, if not all, the hundreds of miles of sewers already made have their fall towards the south, which is the direction of the natural drainage of London, and the fall of these must be reversed, or several large and very expensive intercepting sewers formed.

I am not insensible to the difficulties attending this or any other scheme; but difficulties vanish before a strong will and clear mind, and works quite as great have been accomplished within our own time, although they may have been principally of an engineering and not of a mixed chemical and engineering character.

Hoping that some thoughts in the foregoing remarks may be the seeds of good result to the public,

I remain, &c.,

W. STONES.

BESSEMER IRON.

Sir,—I see scarcely anything in Mr. Reveley's letter which requires any reply or explanation, being content to leave the correspondence as it stands for every thoughtful mind to draw its own conclusions.

I would merely remark, that Mr. Reveley can know but very little of iron manufacture to express an opinion upon any process, whether as at present practised or now proposed as new, when he introduces such a passage as the following into his last letter:—"Mr. Gladstone speaks of the 'forging process' as if Mr. Bessemer's invention was intended to supersede the necessity of that operation."

The fact is, that I spoke of the "forge process," a part of ironmaking well understood, and very different from the term he gives me, which I never used.

Every tyro in malleable ironmaking knows there are two distinct branches of operation in every ironwork, viz., the forge, with its hammer, rolls, and furnaces, and the mill, with its rolls and furnaces. The first preparatory, the second completing the manufacture. Now Mr. Bessemer told me himself that the effect of his process was to render the first needless, as he prepared the iron for the second; hence the saving of at least 40s. per ton.

Without such assistance the saving of fuel alone would not so reduce the cost, but with such a startling assertion as was named to me, the same became self-evident, and it was this which demanded the thoughtful attention of the trade, and was so important to the public.

Mr. Reveley expresses surprise that Mr. Hall and I should have attended the lecture at the Polytechnic Institution, because the illustration was on a small scale. He must be reminded that I had seen Mr. Bessemer's operation; and as the lecturer had instruction from the patentee, and was also a good theorist in iron-making, what more natural than that we should desire to hear what he said thereon? As I have before stated, Dr. Ryan on the chemical part of the process was beautifully clear, while on the mechanical he could not but be very imperfect, and he gladly received my observations as to some points on which he was altogether wrong.

I can only again express my regret that from so loud and portentous a sound of trumpets, so little real progress has been made in improving, simplifying, and cheapening iron-making, as I at one time expected better things.

I am, &c.,
THOS. M. GLADSTONE.

11, Austin-friars.

P.S.—I see that the trials at the Dowlais Works have turned out a complete failure.

FLOATING BREAKWATERS.

Sir,—Floating breakwaters were invented by Mr. Norburg, a Danish engineer, and employed by him at Revel. Sir Samuel Bentham having noticed that within them the water was perfectly smooth, adopted them for the protection of a sea-wall building at Sheerness, and afterwards proposed a floating breakwater for Plymouth Sound. But in this case he recommended a double row of floats, leaving a space between each row, but covering the interstice by the second row. Since then Captain Warner exhibited a similar breakwater off Brighton—the water within it was smooth, but being of an mechanical form it was finally broken and destroyed.

The chief advantages of floating breakwaters are that they do not oppose an artificial rock to vessels running for shelter to port, while small craft can steer between the floats; their capability of being easily moved about till the most suitable place for them be ascertained; their facility of an entire change of site when desirable; and, lastly, their cheapness.

It would seem that floating breakwaters were particularly suited for such a port as Madras. The anchorage in the roadstead is excellent, but within it a constant surf prevents navigation in any other boats but those of a peculiar construction, not carried by ships.

The model of one of the floats of Sir Samuel Bentham's Floating Breakwater, as proposed for Plymouth Sound, may be seen in the United Service Museum.

I am, &c.,
M. S. BENTHAM.

26, Wilton-place.

Proceedings of Institutions.

Cambridge.—A lecture on the Science of "Common Things," was delivered, under the joint patronage of the members of the Philo-Union and Mechanics' Institute, at the Town-hall, on Thursday evening, by Mr. J. C. Buckmaster, (of the department of Science and Art). The attendance was not very numerous, and the entertainment could scarcely have been very remunerative to the societies. The lecture consisted of a description and illustration of some of the commonest and simplest phenomena which are met with in the daily walks of life, and the principles of which, the lecturer contended, ought to form part of the elementary education of the country. He explained the principal laws of gravitation, of combustion, and of heat and cold, and performed some experiments on the different gases. He also gave his auditors an insight into the mechanism of the Davy lamp, the barometer, the thermometer, and the electric-telegraph, as well as of such common objects as the ordinary pump. In conclusion, he said, there were certain things essential in the education of the working-classes especially which constituted the social science of common life, and upon which a lamentable amount of ignorance existed; he alluded to such knowledge as that of social economy, the want of which frequently caused ignorant wives to drive their husbands to the ale-house, instead of making their homes as comfortable as they ought to be. The lecture lasted about an hour in the delivery, and at its conclusion, Mr. Buckmaster was warmly applauded.

Hereford.—At the general annual meeting of the subscribers to the Permanent Library, on Monday, the 16th ultimo, the following officers were chosen for the ensuing year:—*President*—Wm. Aston, Esq.; *Librarian*—E. G. Wright, Esq.; *Treasurer*—W. Pulling, Esq.; *Committee*—F. H. Thomas, Esq.; A. C. de Boinville, Esq.; R. C. C. Honiatt, Esq.; H. C. Beddoe, Esq.; Dr. Bull; J. G. James, Esq.; W. Bullock, Esq.; J. T. O. Fowler, Esq.; N. Lanwarne, Esq.; P. Tully, Esq.; W. H. Apperley, Esq.; and J. F. Symonds, Esq.; *Sub-Librarian*—Mr. Wemyss. In addition to the *permanent* character of this Institution, a proposal to *hire* books of current literature, instead of purchasing them, was adopted at this meeting. By this plan, the sphere and funds of the Institution will be economised, and additional accommodation afforded to those members who are desirous of light reading. Forty volumes, exchangeable at pleasure, will be received at one time, from an extensive library in London. An ample and ever-changing supply of books will thus be secured for the most expeditious readers. In consequence of the crowded state of the Permanent Library, additional room for the regularly-increasing number of books has become necessary. That object has, at present, been effected by the erection, in the centre of the room, of a book-stand, capable of containing nearly one thousand volumes. When the stand shall have received its complement of books, this long-established Institution will present an array of about eight thousand volumes, in every department of literature.

Wenlock.—On Friday, the 5th ult., the fifteenth anniversary of the Agricultural Reading Society was held at Wenlock, M. G. Benson, Esq., president of the Society, in the chair. W. P. Brookes, Esq., honorary secretary; George Burd, Esq., treasurer; Rev. W. H. Wayne, Rev. R. R. G. More, Walter Mosely, Esq., Rev. N. Heywood, W. A. James, Esq., Mr. Phillips, Mr. Horton, Mr. Patten, Mr. Martin, Mr. G. Moreton, &c., and other gentlemen being present. Mr. Brookes read the report, which stated that there has been an increase in the number of subscribers, both to the reading-room and library, the total amount received being £32 10s. more than in the previous year. The number of volumes presented to the Institution during the past year is 62, and of purchased 38, making together an addition of 100 volumes. Two rooms have been added to the Society's Building. A class for drawing has already been established on the government plan, in connexion with the Coalbrookdale, Broseley, and other Institutions, and the number of pupils already on the list is 30. The committee called the attention of the members to the recent proposal of the Society of Arts to hold annual examinations of students of these Institutions, to reward superior attainments by prizes, or give certificates for proficiency in various branches specified, and they trust that these offers will induce the junior members of this Society to form themselves into classes and to contend for the prizes. The report of the Working Man's Reading Society, in connection with this Institution, states that the present number of members is 37. The annual dinner took place at half-past three o'clock, at which there were upwards of ninety present. M. G. Benson, Esq., occupied the chair. Mr. Gaskill, M.P., the Rev. W. H. Wayne, and other gentlemen spoke on the occasion.

MEETINGS FOR THE ENSUING WEEK.

Mon. London Institution, 7. Dr. John Tyndall, "On the Nature and Phenomena of Light."
Architect, 8.
Geographical, 8½. I. Lieut. W. Chimmo, R.N., "Remarks during the Search in the Torch Steamer for the North Australian Expedition, under Mr. Gregory." II. Admiral Sir Charles Elliot, "On the Exploration of the River Orinoco." III. Mr. Thomas Banister, "Proposed Railroad through North America, from Vancouver Island to Hudson Bay."

Tues. Syro-Egyptian, 7½. Mr. W. F. Ainsworth, "On the Euphrates Valley Route."
Civil Engineers, 8. Mr. F. R. Window, "On Submarine Electric Telegraphs."
Med. and Chirurg., 8½.
Zoological, 9.

Wed. Literary Fund, 3.
London Institution, 3. Professor Rymer Jones, "On Vivaria and their Inhabitants."
Society of Arts, 8. Mr. Chief Justice Temple, "On Honduras, its History, Trade, and Natural Resources."
Graphic, 8.
Microscopical, 8.
Archæological Association, 8½.
Ethnological, 8½.

Thurs. Philosophical Club, 5½.
London Institution, 7. Dr. R. E. Grant, "On the Natural History of Extinct Animals."
Antiquaries, 8.
Philological, 8.
Royal, 8½.

Sat. Asiatic, 2.
London Institution, 3. Mr. T. A. Malone, "On Experimental Physics, chiefly in Relation to Chemistry."
Medical, 8.

PATENT LAW AMENDMENT ACT.

APPLICATIONS FOR PATENTS AND PROTECTION ALLOWED.

[*From Gazette, January* 2*nd*, 1856.]

Dated 16*th December*, 1856.

2976. Charles Fréderic Vasserot, 45, Essex-street, Strand—Preserving salmon, trout, and other fish. (A communication.)

2978. William Frederick Thomas, Newgate-street—Improvements in sewing machines.

2980. Frederick William Gerhard, 4, Trafalgar-square—Improved means of obtaining aluminium metal, and the adaptation thereof to the manufacture of certain useful articles.

2982. William Gossage, Widnes, Lancashire—Improvements in the manufacture of sulphuric acid, and in the construction of apparatus used for such manufacture.

2984. Alfred Vincent Newton, 66, Chancery-lane—Improvements in printing presses. (A communication.)

Dated 17*th December*, 1856.

2986. Peter Armand le Comte de Fontainemoreau, 4, South-street, Finsbury—Improvements in obtaining motive power. (A communication.)

2988. John Platt, Oldham, Lancashire—Improvements in mules for spinning. (A communication.)

2989. William Edward Newton, 66, Chancery-lane—An improvement in the manufacture of table knives. (A communication.)

2990. Frederick Levick, junr., and John James, Cwm Celyn and Blaina Iron Works, Monmouthshire—Improvements in the mode of utilising the waste gases of blast furnaces.

2991. John Hall Brock Thwaites, Bristol—A new or improved machine or apparatus for holding postage or receipt stamps, and applicable wholly or in part to other similar purposes.

2992. Charles Cowper, 20, Southampton-buildings, Chancery-lane—Certain improvements in electro-plating.

2994. Vincent Louis Cazimir Renou, Jersey—An improvement in the manufacture of spirit when rice is used.

Dated 18*th December*, 1856.

2996. John Elce and Samuel Hartley, Manchester—Improvements in machinery for moulding.

2998. John Draper, Chiswell-street, Finsbury—Improvements in apparatus for grating and crushing salt and sugar.

3000. Joseph Bower, Hunslet, near Leeds—An improvement in treating animal matters in preparing them to be used for the manufacture of manure.

3002. Charles Fay, Manchester—Improvements in railway carriages and breaks.

3004. François Donny, Ghent—Improvements in the manufacture of lamps.

Dated 19*th December*, 1856.

3006. Louis Beaver, Manchester—Improvements in machinery for propelling vessels.

3008. Robert Hyde Greg and Henry Russell Greg, Manchester, and James Hope, Reddish—Certain improvements in machinery or apparatus for polishing or finishing yarns or threads.

3010. James Penny and John Booth, Heckmondwike, Yorkshire—Improved machinery for washing, cleansing, and drying grain.

Dated 20*th December*, 1856.

3014. John Edridge, Birmingham—Improvements in the manufacture of hair pins, shawl and other dress pins, parts of which improvements are also applicable to the manufacture of clasps and similar dress fastenings.

3016. Captain George Alexander Harrison, 79th Highlanders—Improvements in breech-loading fire-arms.

3018. Thompson Newbury, Taunton, Massachusetts, U.S.—Improved machinery for making screws.

Dated 22*nd December*, 1856.

3020. Theodore Dethier, Pimlico—An improved knife cleaner.

3022. William Mill, Birmingham—Improvements in joining bands, in connecting fastenings to bands, and in attaching bands to articles requiring the same.

3024. Frederick Sampson, Gordon-street, Bradford, Yorkshire—Improvements in apparatus employed in singeing fabrics.

INVENTIONS WITH COMPLETE SPECIFICATIONS FILED.

3027. Daniel West, 17, Egremont-place, New-road—An improvement in presses constructed to operate by a combination of iron levers, which presses are employed to compress bales of cotton, hemp, wool, and other articles of merchandise.—22nd December, 1856.

3056. Jules Henri Etienne Mareschal, Paris—Improvements in hydraulic presses.—24th December, 1856.

3060. Charles Sylvester Rostaing, Dresden—Improvements in preparing and combining metallic substances for the production of colours, and in manufacturing the same.—26th December, 1856.

3076. George White, 5, Laurence Pountney-lane, Cannon-street—An improved poultice. (A communication.)—27th December, 1856.

WEEKLY LIST OF PATENTS SEALED.

January 2nd.

1570. Thomas Chandler.
1574. Louis Cornides.
1575. Edwin Travis and Joseph Louis Casartelli.
1579. James Alexander Manning.
1597. Edward Charles Healey and Edward Ellis Allen.
1636. Stephen Martin Saxby.
1651. John Avery.
1686. Alfred Vincent Newton.
1702. William Noton.
1738. John Brayshay.
1810. William Edward Newton.
1964. Frederick Albert Gatty.
1976. Marc Antoine François Mennons.
2169. Robert Mushet.
2290. Peter Armand le Comte de Fontainemoreau.
2578. Samuel Middleton.
2584. Joshua Murgatroyd.

January 6th.

1602. Joseph Henry George Wells.
1603. Joseph Henry George Wells.
1610. Abraham Herts.
1620. Ward Holroyd and William Noble.
1622. Timothy Jerome.
1642. Jean Baptiste Desire Chevalier and Narcisse Rabouin O'Sullivan.
1645. Benoit Frederic Ortet.
1671. James Ford and P. Knowles.
1681. Henry Bragg.
1694. Peter Hubert Desvignes.
1696. William Beevers Birkby.
1703. James Ryder and Daniel Bentley.
1710. Edward William Young.
1731. Elias Weisskopf.
2069. Ralph Reeder.
2076. Sidney Wesley Park and Edgar Stimpson Ells.
2156. Calvin Kline.
2544. Charles De Jongh.
2586. Ethan Campbell.
2614. William Henry Olley.
2616. Peter Cato, John Miller, junr., and John Audley.
2619. Henry Dircks.
2627. George Bertram and Wm. Mc Niven.
2629. William Porter.

Patents on which the Third Year's Stamp Duty has been Paid.

December 30th.

3039. Julian Bernard.
10. David Kennedy.
17. Julian Bernard.
38. William Edward Newton.

December 31st.

22. Edward Schischkar and F Grace Calvert.
26. Leon Joseph Pomme.

January 1st.

3. Alfred Dawson.
27. John Mason and Leonard Kaberry.
30. Henry Hind Edwards.

January 2nd.

8. Henry Lee Corlett.
11. James Stovold.

January 3rd.

29. David Hulett.

WEEKLY LIST OF DESIGNS FOR ARTICLES OF UTILITY REGISTERED.

No. in the Register.	Date of Registration.	Title.	Proprietors' Name.	Address.
3927	Jan. 2.	Improved Police Lantern	Farwig and Bullock	16, Rupert-street, Haymarket.
3928	,, 6.	The Signaliser	Wm. Gascoigne Shaw	Kingsland.
3929	,, 7.	Stove and Guard	Henry Bamford	Uttoxeter.

Journal of the Society of Arts.

FRIDAY, JANUARY 16, 1857.

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CONVERSAZIONI.

The Council have arranged for two Conversazioni for the Members of the Society and their friends, the first to take place on Saturday, the 21st of February, to which ladies will be invited; the second on Wednesday, the 6th of May, to which gentlemen only will be invited.

NINTH ANNUAL EXHIBITION OF INVENTIONS.

The Council have fixed Monday, the 23rd of March next, for the opening of the Ninth Annual Exhibition of Recent Inventions.

Persons intending to contribute to the Exhibition should communicate with the Secretary forthwith, stating—

1. The title of the invention.
2. Whether the article will be a specimen, model, or drawing.

Articles for exhibition must be forwarded to the House of the Society, *carriage paid.* The days for receiving articles are, Thursday, the 5th, Friday, the 6th, and Saturday, the 7th of March.

All articles should be accompanied with a short description of the invention, for the Catalogue, with a wood-block (when possible), and a reference to any publication where a fuller account may be found.

SIXTH ORDINARY MEETING.

Wednesday, Jan. 14, 1857.

The Sixth Ordinary Meeting of the One Hundred and Third Session was held on Wednesday, the 14th inst., William Schaw Lindsay, Esq., M.P., in the chair.

The following Candidates were balloted for, and duly elected members of the Society:—

Gordon, Col. W. J., C.B., R.E., &c.
Henderson, John.
Keppell, George.
Humphry, William Gilson.
Long, J. A.
Parsons, Thomas.
Ranken, Charles.
Vandeleur, Major Arthur, R.A.
White, Lynch.
Wilcox, Thomas.

The following Institutions have been taken into Union since the last announcement:—

425. Netherton (near Huddersfield), Mechanics' Institution.
426. Clayton Le Moors Institute.
427. Birmingham and Midland Institute.
428. Painswick (Gloucestershire) Mechanics' Institution.
429. Athenæum (Cheltenham).

The following Colonial Institution has been taken into Union since the last announcement:—

Saint James (Jamaica) Society of Industry and Arts.

The following School has been taken into Union since the last announcement:—

Alverthorpe Hall School (near Wakefield).

The Paper read was:—

ON BRITISH HONDURAS, ITS HISTORY, TRADE, AND NATURAL RESOURCES.

By Mr. Chief Justice Temple.

It may appear to be a somewhat bold and presumptuous undertaking on my part, to address an audience upon the valuable commercial resources of a country which has never been mentioned without a sneer, and the utter worthlessness of which has been broadly stated,—of a country which has invariably been spoken of in terms of scorn and contempt, and that, too frequently, with great ingratitude, when the legs of the speaker are comfortably resting under its mahogany, and he is imbibing inspiration from the juice of its logwood, which he fondly imagines to be port. Until a very short time ago, most persons entertained very vague ideas with respect to Honduras. Some thought it was a cluster of islands in the Eastern Archipelago, some believed it to be in Africa, and some thought it not impossible that it might be in the moon, but all agreed that, wherever it was, it was full of swamps, frogs, and toads, and venomous reptiles. The latter impression, to a certain extent, is no doubt sufficiently well founded. There would be no use in denying the existence of swamps; with respect to the toads, St. Patrick would have found abundant employment,—and the venerable Abbess St. Hilda, who cut off the heads of all the snakes in the neighbourhood of the virgin sisterhood over which she presided, would, if she could rise out of the stone coffin in which her valuable relics were deposited, confer a great benefit upon humanity by visiting that portion of the American continent. But we must not hastily condemn a country on account of these trifles, for even in Ireland, that "gem of the sea," I have heard of bogs,—in happy England, not only toads,—but *toad-eaters* abound,—and snakes in the grass are to be found everywhere.

In attempting to deal with this subject, it is not my purpose to enter into any political considerations connected with the colonies, still less is it my intention to indulge in any tirades against the British government, past or present, for indifference to their requirements, and injustice to their claims. It is my conviction that every administration, be it composed of whom it may, will be as solicitous for the welfare and prosperity of our colonies, wherever they may be situated, as of any other portion of the empire; and if latterly some of them have drooped, and ceased to be as flourishing as they once were, the cause of that temporary decline must be sought for, not in the legislative measures of the home government, but in the supineness, inertness, and despondent disposition of the colonists themselves, who have shown themselves deficient in that protean quality which would enable them when an old commercial channel became dried up and profitless, to apply themselves with vigour and determination to the task of opening new ones. I say it is not my object to dwell upon these topics, to chant with melancholy cadence, and in doleful numbers, the sad and sorrowful condition of the colonies, nor to inveigh in ireful strains against the alleged authors of their ruin, but, in plain and simple language, to bring under your notice a possession of the British crown, hitherto but little known,—to describe its geographical position,—state its dimensions,—give a brief account of its history,—make you acquainted with the nature of its soil,—its various animal and vegetable productions,—its general commercial capabilities,—and exhibit a new and a wide field for enterprise, skill, industry, and capital. To do full justice to the subject which I have had the presumption to take in hand, would require more time than you can now spare, or is allowed me, but I trust, with your indulgence, I shall be able to state quite sufficient to convince you that Honduras is capable of producing something besides mahogany and logwood, that swamps and creeping things are not its chief characteristics, and that to the man of energy and will it is capable of yielding a rich reward.

The bay of Honduras is formed by two headlands, the extremities of which are Cape Catoche, on the north, in Yucatan, and Cape Gràcios a Dios, on the Mosquito coast, on the south. At the very bottom of this bay, at the most westerly point, is situated British Honduras, between 16 and 18 deg. N. latitude, and between 88 and 90 deg. W. longitude. The latter, however, cannot be stated with any degree of certainty, as the inland or western boundary has never been clearly ascertained. It is stated that a place called Garbutt's falls, near the head of the Belize river, is a point of limitation, and that the distance between it and the sea coast is 180 miles, hence it has rather hastily been concluded that British Honduras extends in a westerly direction from 180 to 200 miles. The length of that river, however, is no criterion, for in its progress to the sea it pursues a north-easterly course. Its length, measured upon the map as the crow flies, is about 125 miles, but its source is at least 50 miles southward of its mouth.

The northern boundary of Honduras on the seacoast, is the river Hondo, which separates it from Yucatan, and the southern boundary, the river Sarstoon, which divides it from the state of Guatemala. Mr. Montgomery Martin says that the coast line extends about 270 miles, but that I apprehend is a mistake. The distance from the river Hondo to the river Sarstoon, as measured upon the map as the crow flies, is not more than 160 miles, but if allowance be made for the sinuosities of the coast it will amount to about 200 miles. The breadth of Honduras in its widest part is not above 60 miles. This is a very respectable extent of territory. It is 35 miles longer than Jamaica, the largest and most important of our West India islands, and 20 miles broader. The approach to Honduras through kays, rocks, and coral reefs, is extremely difficult and dangerous. For nearly sixty miles your course lies through intricate passages, amongst innumerable islets, covered to the water's edge with an impervious mass of vegetation, principally of mangrove trees, through narrow channels on each side of which are steep walls of coral, and along smooth unrippled waters which are sometimes of the most heavenly blue, and sometimes of the brightest green, and so clear that you may distinctly see the varied inhabitants of that portion of the deep, turtles grazing like sheep in a pasture, here and there a shark prowling about, pyramids of conchs, and hundreds of dolphins, not those time-honoured admirers of music which bore Arion safely across the waves, but those modern fishes of changeful hues which have so often supplied dramatic writers with a simile when they have introduced a son of Neptune upon the stage. Some of the kays or islets which I have mentioned look extremely beautiful from the sea, having a smooth gravelly beach, yellow as the golden sands of Pactolus, on which the blue water breaks in mimic waves, producing a snow-white fringe of foam, small groups of waving cocoa nuts scattered about, and here and there a thick grove of mangrove trees, which appears to offer an agreeable retreat from the noon-day sun. On observing these exquisitely beautiful spots for the first time, one feels disposed to exclaim—

> "Fair scenes for childhood's opening bloom,
> For sportive youth to stray in,
> For manhood to enjoy his strength,
> For age to wear away in."

If, however, we had the curiosity to land, we should find that our rapture was premature and our poetry thrown away; mosquitos and sandflies are stern realities, which admit of no compromise.

The masters of vessels bound to Belize, generally make the west end of the island of Ruatan in the evening, where they lie-to the greater part of the night, in order that they may arrive at Half-moon Kay at day-break, the distance from which is about 60 miles. This gives them the whole of the day to thread the numerous narrow channels through which their course lies. At Half-moon Kay there is a lighthouse, 70 feet high, the light of which can be seen at a distance of 20 miles. The lamp is kept burning the whole of the night, and may always be depended upon. At this kay a pilot is taken, without whom it would be impossible for strangers to proceed with safety. To the south-west of Half-moon Kay there is a small island, covered with mangrove bush, called Hat Kay, from its resemblance to that covering of the head. From this Kay a coral reef, three miles long, extends, which has often been fatal to vessels. They next make a little island called Kay Bokel, which has upon it a few cocoa-nut trees, from which, steering in a south-westerly direction for 12 miles, they arrive at another small island, called English Kay, and pass to the north of it, between it and Goff Kay. They are then 14 miles from Belize. On English Kay there is a flagstaff, to the top of which, the instant a sail is descried, the Union Jack is hoisted, which, with a good glass, can be seen at Belize, where a flag is also displayed, to inform the good people that a ship is coming in. The custodian of this flagstaff is generally some old black sergeant or corporal, who is thus provided for for the remainder of his days. He cannot wander far from the scene of his duties, for the island is not more than 100 yards in circumference. Several years ago, ship after ship came in without having been signalised. This occasioned at first considerable surprise, but it was soon discovered that the poor old man had died, literally at his *post*. The route which I have described is the one which is generally taken, but in the season when the north wind prevails, it is not considered a good one, for the vessels have then to beat all the way to English Kay, which is not a very safe or easy operation in those narrow channels. At that period of the year, therefore, the captains of vessels think it better, instead of Half-moon Kay, to make Mauger Kay, where there is also a lighthouse, from which they may sail to English Kay, a distance of 18 miles, with a fair wind. Vessels come to an anchor about a mile from the town, in about three fathoms water, but vessels of a very large size are obliged to anchor much further off. For nearly 50 miles vessels may lie, in the most boisterous weather, in perfect safety, for a natural breakwater, consisting of reefs and kays, runs along the whole coast. During the norths, which sometimes come down with great impetuosity, they occasionally drag their anchors, but they seldom sustain any serious damage. The appearance of Belize from the sea is extremely striking. Mr. Stevens, in his "Incidents of Travel," compared it to Venice, but I have often looked in vain to discover the slightest resemblance to that "sea-born city." At the embouchure of the river there is a steep wooden bridge, which, by an extraordinary effort of the imagination, may be compared to the Rialto; and there is a timber court-house, with a cupola at the top of it, in which a poet, "his eye in a fine frenzy rolling," may perceive a likeness to the church of St. Mark. But a common-place mind will discern as much similarity between Belize and Venice, as there is between a horse chesnut and a chesnut horse. But, repudiating altogether such lofty comparisons, Belize has, from a distance, a very pretty and picturesque appearance. The church, with its little spire rising amidst a grove of tamarind, almond, and mango trees—the Court-house, with its cupola and flagstaff, from which the Union Jack is flying—the Government-house, with another flagstaff and another Jack—the white, yellow, blue, green, and red houses, interspersed with mountain cabbage and cocoa-nut trees

—Fort George, a small island with half-a-dozen guns upon it, the sole use of which seems to be to fire salutes in honour of the Queen and the superintendent, or some distinguished visitor who is entitled to that noisy welcome, with a third flagstaff and a third Jack (they delight in flags in that country)—all these combined have a very pleasing effect, but they form a picture as unlike as possible anything which may be seen in Europe.

The whole coast of British Honduras, for two or three miles inland, is low, flat, and swampy. But in making use of the word swamp, I do not mean bog, or morass, but, simply, in consequence of its being frequently overflowed with water, a soft, moist, and spongy soil. But the soil itself is a rich, black loam, admirably adapted to the cultivation of rice, and, by drainage, capable of being made equal to any soil in the world. In ascending the rivers, the land gradually rises and assumes a totally different character, becoming a stiff clay. For ten or fifteen miles up the river there is a bank on each side varying in breadth, being sometimes a mile, and sometimes only fifty yards, which is entirely an alluvial deposit, which has been washed down from the mountains in the course of centuries by the heavy floods which occur in the rainy seasons. One of these banks on the the Belize river, belongs to Dr. Young, an intelligent and scientific practitioner of medicine, who has resided for many years in that country. Sometime ago, wishing to drain some swampy land on his property, he dug a deep and wide trench through this alluvial deposit, throwing up the earth on each side. In the course of a little time after the rains and the sunshine had fallen upon this newly exposed earth, he observed with astonishment a plant which he had not seen since he was a student at the University of Edinburgh, and which he greeted as an old friend.—This plant was the Scotch thistle—a perfect stranger in that country. Parallel with these banks there are large tracts of country called pine ridges, in which thick forests of red pine grow in a thin sandy soil. These arid tracts are the abode of vast herds of deer and antelopes, of warrees, and peccaries. The cougar, the jaguar, and the ocelot, with a proportionate sprinkling of snakes, also honour them with their presence. As you proceed still higher, you arrive at long strips of land of again a very different description. These are called cahoun ridges, and on them are found growing, in a rich, deep, loamy, upper soil, being a vegetable incrustation formed of the decomposed withered leaves of thousands of years—in rank luxuriance the cahoun palm. Beyond these ridges, the country spreads itself out in wide savannahs, with here and there thick clumps of tall spreading trees, contrasting with rich green slopes of pasture land, and through these extensive plains fertilizing streams wind in every direction. The country to the south of the Belize river is of a bolder character. The Manati hills, from amongst which the river of that name flows, are from 800 to 1,000 feet above the level of the sea, and the Cockscomb mountains, where the river Sittee has its rise, are 4,000 feet above the level of the sea. There is perhaps no country which, considering its extent, contains so many natural channels of communication, in the shape of broad navigable rivers, tributary streams, and fresh water lagoons. From the northern to the southern boundary there are sixteen wide, deep, magnificent rivers, capable of being navigated by large vessels for a considerable distance inland. They are the Hondo, the New River, Northern River, the Belize River, the Sibun, the Manati, Mullins River, Sittee River, Monkey River, Deep River, Middle River, Rio Grande, Golden Stream, Moho River, the River Termash, and the River Sarstoon. Many of these rivers run a great distance before they fall into the sea. The Sibun, without taking into consideration its numerous windings, runs in a direct line about 60 miles. The Belize river about 90, and the river Hondo about 130. Of the Belize river there are not less than five great branches. In the Manati and Sibun rivers there are long passages through the rocks into which the water flows, and forms spacious subterranean lakes. On entering into these nether regions, holding in his hand a blazing torch of red pine, the traveller is forcibly reminded of the descent of Æneas into the realm of Pluto, and his guide, who is perhaps some ancient crone, with black shrivelled face, blear eyes, and matted woolly hair, is no bad representation of the Cumæan Sybil. But when his light skiff is fairly launched into the still, deep, black waters of that mysterious retreat, a feeling of awe comes upon him. Overhead magnificent stalactites hanging from lofty arches, on all sides splendid crystals of various hues—festoons of moss and leaves sparkling with trickling drops of water—the red flame of the torch—the noise of the paddle dipping into the water and echoed from unseen caverns—the plunge of some wild animal disturbed in its lair, and sometimes fiery eyeballs glaring upon you from some near recess, produce a strange sensation of fear, wonder, and admiration. Captain Henderson, who published a short account of Honduras in 1809, thus describes the Sibun caves:—

"On a branch of the river Sibun, named Indian Creek, are situated the caves; these are subterraneous passages, which have been formed at the base of three or four mountains of very considerable height, no doubt by the force of the current of water, which probably for many centuries has forced its way through them. The largest of these passages is somewhat more than a quarter of a mile in length, though in this country it has a greater extent given to it. It would certainly require no common powers of description to delineate with fidelity the exquisite beauties connected with the largest of the caves. The entrance to it from Indian Creek, after many windings, bursts suddenly on the sight, and resembles very closely the aperture of an oven, and is thickly overhung with rocks and trees of the grandest but wildest workmanship. When this is passed a wide and spacious lake immediately commences, the water of which is silent and deep, being scarcely heard to murmur but during the most tempestuous floods. The lofty roof is arched with the most exact proportion, and is profusely studded with glittering crystallisations. Torch light affords the visitor the only means of advantageously viewing this sublime piece of scenery; for if, in one or two places, an occasional beam of the sun, bursting with inconceivable lustre through the clefts of the mountain, be withdrawn, entire darkness pervades the whole, and the smallest sound made in passing being quickly loudly reverberated, is forcibly calculated to strike the ear with a feeling of solemn grandeur."

The seasons, like most tropical countries, are the wet and the dry; the former commences in the month of June, and continues until the end of February. The latter begins in the month of March, and ends in the first week in June. During the dry season there is scarcely ever a drop of rain; the ground becomes parched and hard, and vegetation ceases, except where streams and creeks irrigate the land. The wet season is ushered in with violent winds from the east, torrents of rain, and the most terrific thunder and lightning, which sometimes continue night and day for three or four days together. Whilst these dreadful storms are hovering about, the lightning is incessant, and the whole night long, though the moon hides her face, and not a star is visible in the heavens, is almost as light as day from the continued outpouring of the electric fluid. There is this peculiarity in the thunder storms in that country, which I have not observed in more northern latitudes. The rain and the wind begin, the former coming down apparently not in drops, but in sheets of water. During this violence there is no lightning—no thunder. In about ten minutes there is a lull, the wind is hushed, the rain has ceased; there is a death-like silence; the sea and the sky appear to be one substance of a dark leaden hue, and thin feathery clouds, agitated by an unseen power, dance to and fro; not a leaf moves, not a bird stirs,—all nature pauses in breathless expectation; then comes the flash, which seems to tear the heavens in twain, followed instantaneously by an explosion, which all the artillery in the world, and at every period of the world, from the first cannon which was fired at Cressy to the last which was discharged at Sebastopol, collected together, could not equal. As it dies away in distant reverberations the wind again rushes forth with unrestrained vehemence, and the deluge again descends. It must not be supposed, however, that because nine months in the year are denominated the wet season, that it is always raining during that period. After the first three weeks of that season there is much fine weather, it being sometimes perfectly dry for a month together, and there is very little thunder and lightning after the first appalling fit. The heaviest and most continued rain, but unaccompanied by thunder, falls in November, December, and January, when cold north winds prevail. A record of the rain which fell in the year 1848 will give an idea of the average amount.

April		
May	$2\frac{5}{10}$	inches.
June	$4\frac{3}{10}$	,,
July	$3\frac{3}{10}$	,,
August	$0\frac{6}{10}$	,,
September	$8\frac{2}{10}$	,,
October	$4\frac{8}{10}$	,,
November	$9\frac{6}{10}$	,,
December	$6\frac{7}{10}$	,,
January	$2\frac{7}{10}$	,,
February	$4\frac{2}{10}$	,,
March		

The temperature ranges from 68° to 86°, although it is sometimes as high as 90°, and sometimes as low as 56°. The following is a table of the temperature of the year before mentioned:—

	Max.	Min.
April	89°	74°
May	89	75
June	90	77
July	90	78
August	90	78
September	91	76
October	87	75
November	85	68
December	86	75
January	82	66
February	85	73
March	83	75

British Honduras appears to be out of the range of hurricanes, which generally expend their violence upon the Windward Islands; and earthquakes, which have at different periods caused such havoc in the Central American States, never exhibit themselves beyond a very gentle trembling of the ground, too slight to do any injury. The climate is exceedingly damp, but that arises principally from the circumstance of the country being for the most part uncleared. Epidemics (with the exception of cholera, which is no respecter of places) never visit Belize. Cases of yellow fever do frequently occur, but they make their appearance like any sporadic complaint—never assuming an endemic character. It might be inferred from this circumstance that Honduras is a very healthy country, but such is not the case. The climate commits its ravages upon the human constitution quietly, silently, insidiously. It is a sapper and miner, and carries on its work of destruction unseen, and almost unfelt, and its effects are only perceived when the hair drops off, the teeth decay, the vision becomes impaired, and the physical and mental energies succumb. However, there can be little doubt, that if the country were cleared, and cultivation more extended, the causes of this gradual and imperceptible decline of the constitution would be in a great measure removed. Much also depends upon the mode of life. If a person is prudent and temperate in his style of living, he may, to a great extent, escape the enervating influence of the climate. There is a gentleman in England at this present moment, 85 years of age, who lived in Honduras for upwards of 40 years, during which time his occupations frequently took him amidst the most unhealthy localities. But, unfortunately, Honduras is a country where all kinds of intoxicating liquors are very cheap, and where a man is always thirsty. The consequence is obvious. The prevailing disease is, in reality, alcohol. Take away that pernicious fluid, and men would live as long in the tropics as in European climates.

At a very early period, as far back as the Protectorate, the various kays in the Bay of Honduras were the resorts of pirates and buccaneers; and many a wild adventure, many a midnight carouse, many a deed of blood, have those little isles been witness to, when Dampier and other free companions of the ocean committed their depredations in the Carribbean Sea. That celebrated navigator, who wrote an account of his voyage to the Bay of Honduras, in the year 1674, gives some amusing sketches of the proceedings of those early settlers. Speaking of the logwood trade, he says:—"This trade had its rise from the decay of privateers; for, after Jamaica was well settled by the English, and a peace established with Spain, the privateers, who had hitherto lived upon plundering the Spaniards, were put to their shifts, for they had prodigally spent whatever they got, and now, wanting subsistence, were forced either to go to Petit Guavas, where the privateer trade still continued, or into the Bay of Logwood. The more industrious of them came hither; yet even these, though they could work well enough if they pleased, yet they thought it dry business to toil at cutting wood. They were good marksmen, and so took more delight in hunting; but neither of those employments affected them so much as privateering; therefore, they often made sallies out in small parties amongst the nearest Indian towns, where they plundered and brought away the Indian women to serve them at their huts, and sent their husbands to be sold at Jamaica; besides, they had not their drinking bouts forgot, and would still spend £30 or £40 at a sitting aboard the ships that came hither from Jamaica, carousing, and firing off guns three or four days together, and though afterwards many sober men came into the bay to cut wood, yet by degrees the old standers so debauched them, that they could never settle themselves under any civil government, but continued in their wickedness till the Spaniards, encouraged by their careless rioting, fell upon them, and took most of them singly in their own huts, and carried them away prisoners to Campeachy or La Vera Cruz." The same author gives an amusing account of one of their drinking bouts. He says—"As soon as we came to anchor we sent our boat ashore to buy provisions to regale ourselves after our long fatigue and fasting, and were very busy going to drink a bowl of punch, when, unexpectedly, Captain Rawlins, commander of a small New England vessel, and one Mr. John Hooker, who had been in the bay a twelvemonth, cutting logwood, and was now coming up to Jamaica to sell it, came aboard, and were invited into the cabin to drink with us; the bowl had not yet been touched (I think there might be six quarts in it), but Mr. Hooker being drunk to by Captain Rawlins, who pledged Captain Hudswell, and having the bowl in his hand, said, that he was under an oath to drink but three draughts of strong liquor a day, and putting the bowl to his head, turned it off at one draught, and so making himself drunk, disappointed us of our expectations, till we made another bowl."

It is generally believed (what will people not believe?) that stores of treasure, the illgotten wealth of those bandits of the deep, are hidden amongst the kays in the bay of Honduras; that huge sea chests, studded with nail and clamped with iron, containing old doubloons and dollars, ingots of gold and silver, antique dresses of silk and velvet, with slashed sleeves and point lace, ancient guns and swords, curiously carved and richly mounted pistols, costly jewels, and all the other heterogeneous materials of a pirate's cave, lie imbedded in their lonely beaches. It has been supposed that the river Belize was called after one of these pirates, a Scotchman, named Wallis, but that is not at all probable. Rivers and mountains seldom lose their ancient names, and that river has always been called Belize by the native Indians. About 60 miles to the west of the British settlement there is a large lake called Itza, in the middle of which are the ruins of what was once a magnificent city called Peten. When Hernando Cortez visited this lake, the city was in all its glory. A considerable extent of country around the lake is called the country of the Itzas. A river flows into the gulf of Dulce, called Isabal. Belize and Isabal appear to me to have been the same name, the one Bel, or Bal-itza, and the other Itza-bal. It is not improbable that the ancient Itzas were worshippers of Isis or the moon, and that the inhabitants of the region about Bel-itza and Itzabal were worshippers both of Bel and Isis, that is of the sun and moon. But this may be all imagination. To return, however, to our free-traders, they soon made the discovery that the country in which they were unlicensed settlers, was rich in the spontaneous production of various dyewoods, of which logwood was the chief. It was not to be expected that men who made no scruple in plundering and murdering the subjects of his most Catholic Majesty, would hesitate to rob his Catholic Majesty himself. They accordingly laid aside the cutlass as an implement of war, and shouldered the axe, and began in good earnest to cut down the logwood of the King of Spain. The woodcutters of the present day never go into the bush without a machete to clear away the underwood, and protect them against the attacks of wild animals. This machete is in reality a heavy cutlass, and there is no doubt it descended from their piratical ancestors. It was no use for the King of Spain to sing "Woodman spare that tree," the marauders went merrily to work cutting down his logwood, which they sent to England, where it fetched a high price. Captain Dampier says—"It was worth from £100 to £110 per ton." At first they did not know the value of it, and Dampier says:—"After the English had taken Jamaica and began to cruise in this bay, they found many vessels laden with it, but not knowing its value then, they either set them adrift, or fired them, saving only the nails and ironwork, a thing now usual among the privateers, taking no notice at all of the cargo, till Captain James having taken a great ship laden with it, and brought her home to England, to fit her for a privateer, beyond his expectation sold his wood at a great rate, though before he valued it so little that he burned of it all his passage home. After his return to Jamaica, the English visiting this bay, found out the place where it grew, and if they met no prize at sea, they would go to Champeton River, where they were certain to find large piles cut to their hand and brought to the sea side ready to be shipped off. This was their common practice, till at last the Spainards sent soldiers thither to prevent these depredations." In a short time an exceedingly profitable trade was established with this country in that article. The buccaneers now settled down as regular traders, cutting wood and shipping it to England in a perfectly mercantile manner, but still so far adhering to their old practices, that they never hesitated to seize by violence what was not peaceably conceded to them.

The forcible occupation of a large tract of country, avowedly in the territory of the King of Spain, was not at first openly defended, although not disapproved of by the British Government, for the dyewoods which it produced in great abundance were objects of no slight importance to English manufacturers. They were at length, after many struggles, so firmly settled, that Spain, which had then begun to display evidences of its decaying strength, was compelled to acknowledge them, and by the treaty of Madrid in 1670 it was agreed "that the serene King of Great Britain, his heirs and successors, should have, hold, keep, and enjoy for ever, with plenary right of sovereignty, dominion, possession, and propriety, all those lands, regions, islands, colonies, and places whatsoever, being or situated in the West Indies or in any part of America, which the said King of Great Britain and his subjects do at present hold and possess, so that in regard thereof, or upon any colour or pretence whatsoever, nothing more may or ought to be urged, nor any question or controversy be even moved concerning the same hereafter."

Notwithstanding this treaty, the Spanish inhabitants were determined if possible to drive the English out of the country, and frequent and bloody skirmishes took place between the two people, which almost always ended to the disadvantage of the former.

At length, in the month of April, 1754, the Spaniards were determined to make a vigorous attempt to dislodge the English, and conscious of their inability to approach them from the sea, owing to their ignorance of the numerous reefs and shoals, which rendered the navigation of those waters extremely difficult to any but those who were intimately acquainted with them, they resolved to attack them from the land side, and for that purpose assembled a large force at the city of Peten. Fifteen hundred men were marched against the English, and were encountered by a gallant band of 210, the greatest portion of whom were slaves, and completely defeated. Before the arrival of the main body of the English, eight men defended a small fort for two days against the attack of the whole Spanish force. After this unsuccessful attempt of the Spaniards to dispossess the English of the country which they had appropriated, the latter were left unmolested for several years, and in 1763 a treaty was signed at Paris, by which it was agreed on the part of his Britannic Majesty that all fortifications in the Bay of Honduras, erected by his subjects, should be demolished, and on the part of his Catholic Majesty, that the English should not be disturbed in their occupations of cutting, loading, and carrying away logwood. To insure the observance of this treaty the British Government sent out Sir W. Burnaby, who not only settled the limits within which the English were to confine their wood-cutting operations, but, following the example of "the great Lycurgus," as he was called on a recent occasion, he composed for them a code of laws, in which perhaps there was as much wisdom as in those of the Spartan legislator. They might, however, be sufficiently adapted to the rude people for whose government they were designed. Captain Henderson, writing in 1804, thus speaks of them:—"When these regulations were therefore enforced, it must be believed that it was merely intended that some direction or restraint should be employed on a description of persons who had before lived without respect to rules of any kind, and whose irregularities, murders, piracies, and atrocities of every sort, were continually perpetrated with a barbarous indifference, because punishment was unknown."

The British settlers were now, for several years, permitted to pursue their occupations in peace, and no doubt they continued, as their numbers increased, to make fresh encroachments on the Spanish territory. In all their encounters with the Spaniards they had hitherto been successful, but they were at length destined to experience a severe reverse of fortune. On the 15th of September, 1779, they were suddenly and unexpectedly attacked by a powerful Spanish force, and utterly defeated, and their moveable property was seized, their houses burnt, and they themselves loaded with chains and conveyed on foot to Merida, the capital of Yucatan, from which place they were after a little time marched to the sea coast and shipped to Havana. When they arrived at that city they were thrown into dungeons, where great numbers of them perished. In 1782, those who had survived the cruelties which had been practised upon them were liberated and permitted to go to Jamaica. For three or four years the settlement appeared to be broken up, but in 1783 we find it again in full vigour. In that year a definitive treaty between Great Britain and Spain was signed at Versailles. By this treaty it was agreed that his Britannic Majesty's subjects should have the right to cut and carry away logwood within certain districts therein described, between the river Hondo and Belize. The treaty required that all subjects of his Britannic Majesty, who might be dispersed upon the continent, or amongst the islands dependent upon the continent, should, within 18 months, retire within the boundaries laid down, and it also stipulated that all fortifications which the English settlers might have erected should be destroyed.

Simultaneously with the Belize settlement, a similar one had been formed on the Mosquito shore,—but not for the purpose of logwood cutting, for there is no logwood to the south of the river Belize. The Mosquito Indians declared that they had never been conquered by the Spaniards, and they made a formal cession of their territory to the crown of England, at the time the Duke of Albemarle was governor of Jamaica. The Mosquito settlers did not confine their mercantile operations to the vegetable productions of the country—they dealt in another commodity, which, if not equally creditable was at least much more profitable. They trafficked in human flesh. Taking advantage of the wars which frequently occurred—and very likely stimulating them for their own atrocious purposes,—between the Mosquito men or Waikas and the other Indian tribes who lived in the interior of the country, they purchased of the former their prisoners taken in battle, and not improbably of the latter their Mosquito prisoners, for they do not appear to have been governed by any principles of honour or honesty, and sent them to Jamaica and other places where they were sold as slaves. Nothing more clearly shows the waning power of Spain at that time than the fact of a band of buccaneers and smugglers, persisting in maintaining forcible possession of a country, without any regular military force, and without assistance of any kind from their own government, in defiance of the remonstrances of that state and its attempts to dislodge them. If such proceedings had taken place in the palmy days of Spain,—if in the height of her military and naval renown,—when subjugating the Moors, conquering Mexico and Peru, rivalling France, and holding in prison one of the most valourous of the princes of that chivalrous nation, a horde of pirates had planted their feet upon any portion of her territory, they would very soon have been hurled into the sea. But the canker worm had commenced, and Spain was fast sinking to that depth of degradation which she has now fully reached. In 1741, the Jamaica House of Assembly passed an act which declared that Indians, who, after that time, should be imported into the island should be free, and all sales should be null and void, but provided that all persons who should be already seised of any Indian slaves should have power to sell or otherwise dispose of them in as full and ample manner as they might have done before the passing of that act. In the year 1776, the Superintendant and Council of the Mosquito shore passed a similar act. Up to the year 1821, a great number of these Indians, or their descendants, were slaves. In that year they presented a petition to Sir George Arthur, who was then Superintendant of Honduras, praying to be liberated. After a great deal of correspondence upon the subject, and an investigation conducted by commissioners appointed by the British government, it was decided that these poor creatures were legally held in bondage, but their emancipation, with compensation to their owners, was strongly recommended. This course was adopted.

But to return to the English settlers at Belize. In the year 1786, a fresh treaty was concluded between Great Britain and Spain. By this treaty, his Catholic Majesty, overflowing with sentiments of friendship and regard for his Britannic Majesty, grants to the English more extensive limits than those specified in the last treaty, for that only permitted them to cut logwood between the rivers Belize and Hondo, but this authorises them to occupy for that purpose the country between the Belize and the Sibun; and as a greater proof of his disposition to oblige the King of Great Britain, he grants to the English the liberty of cutting all other wood, without even excepting mahogany, as well as gathering all the fruits or produce of the earth purely natural and uncultivated, which might, besides being carried away in their natural state, become an object of utility or of commerce, whether for food or manufactures. It was agreed that nothing should be done by the English which should derogate from the right of the Spanish sovereignty, and it was also stipulated that the English should evacuate the country of the Mosquitos, and confine themselves within the prescribed limits. A Honduras author, who flourished some thirty years ago, and who no doubt inherited much of the spirit of the early settlers, thus quaintly remarks upon this treaty:—"His Catholic Majesty thought proper to grant formally to the British the right of cutting the mahogany, as well as the logwood, but which *right* they had, many years ago, *deemed fit* to take without his permission."

In the year 1787, in accordance with one of the stipulations of this treaty, the settlers on the Mosquito coast evacuated that territory, and came to Belize, with their families, slaves, and effects, thus adding very materially to the population, power, and wealth of the Honduras settlement. For several years things went on in the usual way, the Spaniards constantly attacking the English, and the latter making bloody reprisals. At length the Spaniards were determined, by an action vigorous and sudden, to put an end to these disputes, and drive those pertinacious Anglo-Saxons from their shores, or utterly exterminate them. With this view, on the 8th of July, 1798, they assembled a large force at Campeachy, in Yucatan, and with 13 vessels, containing 2,000 men, commanded by General O'Neill, set sail for St. George's Kay, leaving 3,000 men to follow in other ships. St. George's Kay is a small island to the north-east of Belize, about a mile in length, but in some places extremely narrow. This is covered with sand, or rather with very small fragments of shell, which is the material found upon all the kays scattered about that coast. Cocoa-nut trees grow luxuriantly, from one end to the other, and it might not inappropriately be denominated the "Isle of Palms." In the early periods of the settlement, St. George's Kay was the capital. Here were the principal houses, here were the stores, here was the seat of government, and here the vessels destined to carry to Europe mahogany and logwood were loaded. In more recent times, it has been used as a resort for invalids, for which the purity and salubrity of the air eminently adapt it. Some half-century ago, a Honduras writer, who must have imbibed large draughts of the Castalian fountain, gives the following glowing description of this blissful abode:—

"At some seasons St. George's Kay is frequented by the inhabitants of Belize, as a watering-place, at which time it appears more the habitation of a large united family, than a meeting of individuals of different pursuits and distinct interests, and where, without such adventitious aids as the blaze of an assembly, or the vanity fair of a pump-room, happiness is enjoyed in the *most compact form* that earth can exhibit."

From this captivating description of "compact happiness," we are led to infer that that blessed period had arrived in this oasis, when the wolf should dwell with the lamb, and the leopard lie down with the kid; and we are put in mind of those friendly societies and small family parties which are sometimes exhibited near the National Gallery or Waterloo-bridge.

I have stated that the expedition started on the 8th of July. On the 10th it approached near to St. George's Kay. The settlers, having got some intimation of the intended attack, had not been idle. Every description of boat which they had at hand was manned. On every reef and shoal a platform was placed, with a cannon upon it. The *Merlin*, an English sloop-of-war, happened fortunately to be there, and gave them assistance. When everything was prepared, the settlers, with a most heroic spirit, burnt all their houses and property upon the kay, and then poured a destructive fire into the Spanish flotilla. The battle raged two days and nights, with alternate success. The English fought with the dogged and determined spirit of their race; but they were materially assisted by their slaves, who displayed a most extraordinary courage and resolution. After a terrific slaughter on the Spanish side, a triumphant victory remained with the English. This was the last battle. Several of the settlers had previously, in contravention of the treaty, been turned out of the Northern Rivers. After their victorious encounter, they not only resumed their old possessions to the north of the Belize river, but considering the treaty to be now annulled by its violation by the Spaniards, with the knowledge and authority of their government, they seized the whole of the country to the south of that river, as far as the Sartsoon, of which they have held undisturbed possession until the present day. Any claim which the Central American States may set up to that territory, on the ground that they succeeded to everything which belonged to Old Spain, is simply absurd. From the year 1798, the English had shaken off the trammels of treaties, and taken forcible possession of the country, independently of Spain. The Central American States did not throw off the Spanish yoke until the year 1821. Nor was the conduct of the settlers in this matter unsupported by the British government Their gallant behaviour in defending their rights, and resisting so successfully an organised and powerful force directed against them by the Spanish government, gave so much satisfaction at home, that his Majesty directed the following communication, contained in a letter from the Duke of Portland to the Earl of Balcarres, dated Whitehall, 8th February, 1799, to be made to them:—

"I had great pleasure in laying before his Majesty the account you transmitted of the defeat of the Spanish flotilla, in its attack upon our settlement of Honduras.

"The able and judicious conduct of Lieut.-Colonel Barrow, Captain Moss of the *Merlin* sloop, the bravery of the troops and seamen under their respective commands, and the spirited exertions of the settlement in general on this occasion, have been such as to receive his Majesty's approbation, which your lordship is hereby directed to signify through Lieut.-Colonel Barrow, together with the just sense his Majesty entertains of their gallant and meritorious conduct."

The trade of British Honduras has hitherto been confined to logwood and mahogany; no cultivation to any extent has been carried on for the purpose of producing other articles of commerce. When, and under what circumstances, mahogany was first introduced into Europe it is not easy to say. Some have supposed that it was first discovered in the island of Trinidad by the carpenter of one of Sir Walter Raleigh's vessels. It is related that, the ship requiring some repairs, this officer went on shore to look for some wood for the purpose, which, having found, he cut and brought on board. When he came to work it up he was surprised at its hardness and beauty; and drawing attention to it, it was soon very greatly in demand for articles of furniture. This account is scarcely to be believed. There are many articles of furniture now in existence which were manufactured in the days of Elizabeth and the Stuarts, but I do not think one can be found which is made of mahogany. Some say it was not introduced into England until about 1802-3. It is said that a Mr. Gibbons, of London, had a brother who was master of a vessel trading to the West Indies, This worthy skipper, hearing that the doctor was building a new house in King-street, Covent-garden, very fraternally sent him a quantity of wood, which he had brought in his ship as ballast. This wood was so hard that the carpenters could not work it up, and it was thrown aside as useless. But one day Mrs. Gibbons, who, it appears, was a thrifty dame, and did not approve of burning candles at both ends, resolved to have a box made, in which those illuminators (I am afraid they were not Price and Co.'s) might be safely kept, and every fragment thereof carefully preserved, and she selected a piece of this rejected wood for the purpose, which turned out to be mahogany. When it was made and polished, it was so beautiful, and the Doctor was so pleased with it, that he determined to have a bureau made of the same material, in which he might deposit his fees. When the bureau was finished, it was shown to the Duchess of Buckingham, who was equally charmed with the wood, and she determined to have a case made in which she might preserve her jewels. By these quick gradations—from the candle-box of a citizen's wife to the jewel-case of a peeress—mahogany became known in England. This story, however, savours much of the style of that ingenious princess who managed to keep her head upon her shoulders by a series of amusing fictions.

It is hardly likely that the captain of a West India trader, laden with sugar and rum, and also much spice, would take a quantity of wood into his ship for ballast. Besides, we are informed that many years previous to the treaty of 1786, the settlers "had taken the liberty of cutting mahogany," without the permission of the King of Spain. There must then have been a good market for that article in England long before 1803 or 1804, and Dr. Gibbons could not have had the honour of introducing mahogany to an admiring world. The time allowed to me will not admit of my giving a particular account of the mode of finding, cutting, and preparing the mahogany. I will merely state that the cutting commences in the month of August. In April and May, in which months the ground has become perfectly hard, from the continued dry weather, the wood is carried upon trucks drawn by bullocks to the water's side; and about the middle of June, when the rivers are swollen by the floods, the logs are floated down to about 10 miles from the mouths of the different rivers, where they are confined by a heavy boom drawn across the stream. Here the owners select their respective logs, form them into rafts, and so float them down to the sea. The mahogany is always trucked in the middle of the night, the cattle not being able to perform such laborious work during the heat of the day. It is a picturesque and striking scene—this midnight trucking. The lowing of the oxen, the creaking of the wheels, the shrill cries of the men, the resounding cracks of their whips, and the red glare of the pine torches in the midst of the dense dark forest, produce an effect approaching to sublimity.

An impression has latterly existed that almost all the mahogany in British Honduras has been cut. This, however, is a mistake. There is sufficient wood in the country, both on granted and ungranted lands, to supply the European as well as the American markets for many years to come. A considerable quantity of mahogany has been, within the last few years, cut in the state of Honduras and on the Mosquito shore; but the mahogany works in the former country have been almost entirely abandoned, partly on account of the wood which is accessible being nearly all cut, and partly on account of the extra freight and insurance which are required when vessels are loaded on that coast. From the Mosquito shore very few cargoes have been lately sent, for the wood which grows there, although it is very large, is of an inferior quality. The mahogany tree requires a rich, dry soil. The best mahogany is found to the north of the river Belize. In consequence of the nature of the soil in that district, in which there is a great quantity of limestone, the mahogany is longer in coming to maturity, but when fully grown, it is of a harder and firmer texture than that which is found in the southern portion of the settlement. There is no wood more durable than mahogany, and none which is so generally useful. It is stated in a little book called "The Mahogany Tree," that furniture is being made in the royal dockyards out of the beautiful mahogany found in breaking up the old line-of-battle ship the *Gibraltar*, which was built in Havana 100 years ago. The English and French governments purchase yearly a large amount of mahogany for their dockyards. During the last year the British government required 12,000 tons, paying £10 17s. 6d. per ton. The French government took 3,000 tons at the same price. The Royal yacht is built principally of Honduras mahogany. Private shipbuilders are, however, reluctant to make use of mahogany for their vessels, as Lloyd's Committee exclude all ships of 12 years' standing in which the floors, futtocks, top-timber, keelson, stem, and sternposts, transoms, knight-heads, hawse timbers, apron, and dead wood, are made of mahogany. Mahogany vessels of ten years' standing they admit, but even those, I am informed, it is their intention very shortly to exclude. The reason which they assign is, that mahogany differs very much in quality, and it is impossible to know when a ship is built of good, or bad wood. But this difference in quality depends entirely upon the district in which it has grown. If they restricted the shipbuilders to the northern wood, they might admit vessels of 12 years' standing without any risk. In the year 1846 the Honduras merchants presented a memorial to Lloyd's Committee, praying for a removal of the existing limitations to the general use of mahogany in the building of vessels of the highest class. Attached to this memorial were numerous certificates from persons well qualified to give an opinion upon the subject, speaking in the highest terms of mahogany for shipbuilding. Captain E. Chappell, R.N., Secretary to the Royal Mail Steam Packet Company, says, "Has seen *Gibraltar*, 80 gun ship, which was broken up at Pembroke. *This ship is entirely of mahogany;* captured of the Spaniards in 1780; *all her timbers sound as when put into her.* Tables for the whole navy made of the timbers of the *Gibraltar*. The steamer *Forth*, built by Mr. Menzies, of Leith, has as much mahogany put into her as could be obtained. The use of mahogany ought to be the *rule*, and not the exception." The qualities of mahogany which render it peculiarly fitted for shipbuilding, are its lightness and buoyancy, its freedom from dry rot, and its non-liability to shrink or warp. The price of mahogany varies according to the size, figure, and quality of the wood. One tree from the northern district, which was cut into three logs, sold for £1,800, or 10s. per superficial foot of one inch. Southern wood, of a small size and inferior quality, has been sold at 3½d. a foot. The present prices in London for small sized plain mahogany are from 5d. to 6d. per foot; for large sized plain from 7d. to 10d., and for large of good quality and figured from 9d. to 1s. 6d.

The yearly average quantity of mahogany exported from Honduras during the last ten years is about eight millions of feet, equal to 20,000 tons, or 200,000 tons in the whole ten years, requiring 160,000 trees.

The Honduras logwood trade has greatly increased of late years, owing to the dye being much superior to the dye of the logwood which is cut in Jamaica and St. Domingo. The price of the former is 40 per cent. higher than that of the latter. The Honduras wood sells for £7 per ton, and the Jamaica and St. Domingo wood for £5 per ton; this is a very different price from that which it sold for in Dampier's days. He tells us that it then sold for a £100 per ton, which, allowing for the difference in money, would be equal to £200 at the present day. The Jamaica and St. Domingo wood is used in the dyeing of carpets and other coarse cloths; but the Honduras wood is used in dyeing all kinds of woollen, cotton, and silk fabrics. A considerable quantity of Honduras logwood is shipped yearly to Oporto, whence it comes to us as prime port wine, recommended by the faculty for its superior nutritious and astringent qualities. A large quantity of logwood is also exported to the United States. Captain Dampier thus describes the logwood trees:—

> "They are much like our white thorns in England, but generally a great deal bigger, the rind of the young growing branches is white and smoooth, with some prickles shooting forth here and there, so that an Englishman not knowing the difference would take them for white thorns, but the body and the old branches are blackish, the rind rougher, with few or no prickles. The leaves are small and shaped like the common white thorn leaf, of a palish green. We always chose to cut the old black rinded trees, for these have less sap, and require but little pains to chip or cut them. The sap is white, and the heart red; the heart is used much for dying, therefore we chip off all the white sap till we come to the heart, and then it is fit to be transported to Europe. After it has been chipped a little while it turns black, and if it lies in the water it dyes it like ink, and sometimes it has been used to write with. Some trees are five or six feet in circumference, and these we can scarce cut into logs small enough for a man's burden, without great labour, and therefore we are forced to blow them up. It is a very ponderous sort of wood and burns very well, making a clear strong fire and very lasting. We always harden the steels of our fire arms, when they are faulty, in a logwood fire if we can get it."

The imports and exports, and the inward and outward shipping of Honduras from the year 1824 to 1836, may be found in Mr. Montgomery Martin's book on "The Colonies of the British Empire," and that portion of his work may be depended upon, for his information was derived from returns furnished him by the Colonial office. I shall begin with the year 1846. The exports in that and the follow year were as follows:—

	1846.	1847.
Mahogany	9,567,570 feet	6,502,777feet
Cedar	4,139 feet	10,337 feet
Logwood	4,314⅓ tons	3,222¾ tons
Fustic	19¾ tons	—
Rosewood	1 ton and 37 pieces	206¼ tons
Cochineal	5,565 seroons	5,684 seroons
Indigo	387 seroons	611 seroons
Sarsaparilla	101,031 lbs.	53,689 seroons
Hides	1,488	1,299
Tortoiseshell	150 barrels	45 lbs. and 1 box
Cocoa Nuts	529,430	536,490
Specie	276,496 dollars	—
Preserved Turtle	49 cases	10 turtles
Plants	41 boxes	6 boxes
Gum	1 bag	—
Lignum Vitæ	—	10 tons
Cases of Cigars	—	4
Tobacco	—	23 bales and 2 boxes
Belly Webwood	—	6 pieces
Santa Maria	—	6 pieces
Sappodilla	—	128 pieces

In 1848 the total value of the imports amounted to £166,611 19s. 5d.; of which there came from Great Britain, £110,851 7s. 9d.; from the West Indies, £402 6s.; United States of America, £53,660 15s. 2d.; From foreign states, £1,679 16s. 6d.

The total amount of the exports was £353,782 10s. These consisted of, mahogany, 7,947,983 feet; logwood, 4,332 tons; rosewood, 23 tons; hides, 1,775; tortoise shell, 659 lbs.; fustic, 10 tons; braziletta, 15 tons; cochineal, 6,182 seroons; indigo, 419 seroons; sarsaparilla, 23,250 lbs.; old copper, 7,993 lbs.; cocoa nuts, 319,943 nuts; specie and bullion, £65,840 4s.

In 1849 the total value of the imports was £237,861.

The total amount of the exports was £301,888.

The tonnage entered inwards in that year was 18,521 tons; the outward tonnage was 18,626 tons.

In 1850 the total amount of the imports was £196,554. The amount of the exports was £261,015.

The amount of the tonnage entered inwards in 1850 was 28,748 tons, and outwards, 23,935 tons. In the year 1850 there was a decrease in comparison with the former year in cochineal amounting to £50,000; but there was an increase upon mahogany of £16,000, and upon logwood of £6,000. In sarsaparilla there was a surprising increase. In 1848, the amount exported was 23,000 lbs.; in 1849, 160,000 lbs., and in 1850, 432,000 lbs. The value of sarsaparilla in the Honduras market is about 6d. per lb.; but sarsaparilla, indigo, and cochineal are not the produce of British Honduras, but are sent from the Central American States. I shall speak more of those articles by-and-bye.

In 1851 there was a decrease in imports amounting to £87,707, and in 1852 there was a decrease of £99,840. The cause of this diminution is stated in the blue book for the latter year to have been the distressed condition of the Central American States. That may have been partly the reason, for the frequent dissensions which occur in those countries very materially impede the progress of trade and cultivation, but the principal cause was the fact of the Central American States getting their manufactured goods direct from Great Britain and Germany. Several years ago all the dry goods which were required in Guatemala were purchased in Belize, but latterly the principal houses in that State have found it to their advantage to have their goods sent direct from Europe, round Cape Horn to Estapa on the Pacific. They are sometimes sent to Belize, where they are transhipped to Isabal, from which place they are carried to the city of Guatemala, on the backs of mules. The latter route is very expensive and dilatory, and is attended with considerable risk. The charge is a dollar for every 25 lbs. A mule will carry 300 lbs., so that one load costs twelve dollars, which is about £2 8s. This, when added to the freight from England and the freight from Belize, increases very greatly the price of the goods. The progress of the mules is, likewise, very slow, for, although if the weather be favourable and the ground be dry, they may sometimes travel twelve miles in a day, they frequently do not advance more than two or three, and it is not a rare occurrence for them to be stopped altogether by the mud. Sometimes a mule will take it into his head, or into his heels, to tumble down a precipice with his load upon his back. I have stated that the principal merchants procure their goods direct from Europe, but there are many petty dealers, who, not being able to employ buyers in England, and to make regular remittances, still resort to Belize to make their purchases, where they are allowed 12 months' credit. This class of traders generally pay for their goods in old church plate (which has no doubt been stolen), silver bullion, and gold dust. These gentry require to be sharply looked after, for they not unfrequently have recourse to tricks, which, though Shylock might have called "thrift," we are apt to designate by a harsher term. One ingenious contrivance is to stick a lump of clay, or a good-sized stone, into the middle of a piece of silver ore. But the Belize merchants are generally too sharp to be taken in by this device. The late Mr. Patrick Walker used to say, that if a man had graduated at Belize he was fit to transact business in any part of the world. Mr. Walker was that potent enchanter by whose magic wand the Mosquito shore was metamorphosed into the kingdom of Mosquitia, and at whose instance the mighty autocrat of all the Mosquitos, George Augustus Frederick, was crowned, with great pomp and ceremony at Belize, by the bishop's commissary, whilst a band of music played the appropriate air of that popular song commencing with the words, "Hoky, poky, winky, wang." In the year 1853 there was a deficiency in the value of the imports from the West Indies and foreign states, compared to those of the former year, amounting to £4,000, but from Great Britain and the United States there was a slight increase. In the exports there was a deficiency amounting to £46,000, there being a decrease to Great Britain of £63,000, and an increase to the United States of £20,000. The total amount of the exports to Great Britain, the United States, and other countries, was £345,377. The total amount of outward ships, 23,936 tons, and the number of men employed was 990. In 1854 there was a very great increase both in the imports and exports. The amount of the imports I have not been able to get correctly; the amount of the exports was £452,313. The inward ships amounted to 31,124 tons, and the outward ships to 27,803 tons. The number of men employed was 1,259. I have now stated the amount of the trade of Honduras up to the last report. The staple commodities which form the export trade of that settlement are principally mahogany and logwood. Some cocoa-nuts are occasionally exported as broken stowage, but the quantity is too trifling to deserve particular notice.

The population of Honduras has greatly increased of late years. When the war broke out in Yucatan in 1848, between the Indians and Spanish inhabitants, or Mistetzos, as they are called, being a mixture of the Spanish and Indian, there was a great influx of both people into Honduras, where they came as to a city of refuge. There is much difficulty in taking a census of the population of Honduras. In 1848 it was supposed to amount to about 14,000, but since that time I have no doubt the population is more than trebled. Belize contains a ranging population of from 5,000 to 8,000. At Christmas the town is always very full, for at that time the labourers come from the various mahogany works to receive their wages, if any be due to them, and to enter into contracts of service for the ensuing year. It is then that you see a class of men who, from their height, symmetry, and muscular development, would form splendid models for a Hercules, or an Antæus. When these men are actively employed it is curious to observe the play of their muscles, which rise and fall like the swelling of a sea in gentle motion. At Christmas there are pitpan races between the negroes and the Caribs. A pitpan is a long flat-bottomed boat, deep and wide in the middle, but shallow at the ends, which are square. Some of them are fitted with a wooden awning, which can be removed at pleasure. It is made of one log of wood, which is sometimes mahogany, and sometimes cedar. This kind of boat was no doubt used by the Indians previously to the discovery of America, and is, most probably, of very ancient origin. Bryan Edwards, in his "History of the West Indies," says, that Bartholomew Columbus met one of them in passing through the Gulf of Honduras. It was eight feet in breadth, and in length equal to a Spanish galley. Over the middle was an awning, composed of mats and palm tree leaves; underneath which were disposed the women and children. The pitpan race is a curious spectacle; the enormous length of the boat, sometimes sixty feet,—the great number of paddlers, with their bodies naked to the waist, and black and shining as polished ebony,—their broad brawny chests, and muscular backs and arms,—their shrill, dissonant, ferocious cries,—their wild gestures, sometimes plying the paddle with inconceivable vigour, which sends the canoe with the swiftness of an arrow through the water, sometimes hurling it into the air, and dexterously catching it as it falls, and sometimes dashing up the spray, which, for a moment, makes them invisible, present altogether such an exhibition of savage nature as to cause the beholder for an instant to doubt whether the wild creatures he sees belong to the same species as himself. They are, however, very fond of music, which, it is said, "tames the savage beast." If you engage a party of them to paddle you up any of the rivers, they generally insist upon indulging you with a song, neither the air nor the words of which would, I am afraid, be duly appreciated at her Majesty's theatre.

The town of Belize occupies a space of at least two miles in length. Before the recent fire, which consumed so many buildings, there were, at the lowest computation, 1,500 houses. Those which are occupied by the most respectable portion of the inhabitants, are, for the most part, large and elegant structures, having in front spacious verandahs. There are two pretty little churches, a Baptist Chapel, a Presbyterian Chapel, a Wesleyan

Methodist Chapel, and there was, but it has unfortunately been burnt, a Roman Catholic Chapel. It has been said that Honduras is only capable of producing mahogany and logwood. Why the very fact of mahogany growing in such abundance is the strongest proof of the fertility of the soil. The mahogany tree will not flourish except in a dry, rich soil,—and this again proves that Honduras is not wholly a swamp. Wherever mahogany will grow, there every tropical product will flourish ; wherever logwood grows, there you can produce the finest rice. I will now proceed to mention a few vegetable products, besides mahogany and logwood, which not only can grow but do grow in Honduras. Captain Henderson, the intelligent writer from whose book I have before quoted, says, " Few countries, perhaps, ever possessed higher advantages, in an agricultural point of view, than the greater part of that which is placed contiguous to the bay of Honduras. It is certainly but imperfectly known to us, but what has been ascertained respecting it discovers in a very striking degree the vast obligation it owes to nature, if it be not in any way beholden to the industry of man. The extraordinary benefits which might result from the happiest combination of climate and soil are almost disregarded; and the cultivation of the earth, which, in almost every other spot of the habitable world, claims our first regard, is here held of no consideration at all. Pursuits, therefore, of the most important utility give place to those which are viewed as being infinitely more profitable. Nor is it probable that such resources will suggest themselves until the opportunities afforded by the latter shall begin to fail. This must happen, and it will be only then that the real value of this country can possibly be discovered."

The cocoa-nut tree, of course, grows in Honduras, and can be cultivated to any extent. This tree will flourish in the most sterile soil. Where nothing else will grow, where not a blade of grass can be seen, this tree, crowned with its broad, plume-like, drooping branches and pendant clusters, bends its tall stem and courts the breeze. It is about eight years in arriving at maturity. At the expiration of that time it is in full bearing. The average value of a cocoa-nut tree is three dollars per annum. If a person, therefore, chooses to plant a thousand cocoa-nut trees, which is the easiest thing in the world to do, at the end of eight years he will possess a secure income of £600 per annum. The great importance of the cocoa-nut tree has been long recognised. From the kernel of the nut a valuable oil is made, which is now much used in the manufacture of candles and soap, and from the husk a species of fibre is made, which has within the last few years been successfully employed in the manufacture of matting. This fibre is also frequently used in the stuffing of mattresses and cushions, for which it is an excellent substitute for horse-hair. It is equally elastic, though not so durable. But its cheapness recommends it as an article of commerce.

There is another species of palm in Honduras, called the mountain cabbage. This tree grows to the height of 100 and 120 feet. The stem is quite smooth and perpendicular, and like the cocoa-nut the branches droop gracefully from the top. There is a singular feature in this tree, which I have not noticed in any other of the palm tribe—the stem, from the bottom to the top, is surrounded with a succession of rings of a darker coloured bark. Until the tree has arrived at its full growth, its age can be ascertained by the number of rings which it possesses. The topmost portion of the tree is a delicious esculent. It is perfectly white, and is, in appearance, very like the tusk of an elephant. It consists of a number of thin, crisp laminæ. When this is boiled, it resembles, both in appearance and taste, the Jerusalem artichoke. It also makes an excellent pickle. But to obtain the cabbage it is necessary to cut down this beautiful tree,—which is sometimes too great a sacrifice for one dish. But the most valuable tree in British Honduras is, unquestionably, the Cahoun palm. The branches of this tree resemble those of the cocoa-nut, but instead of growing from the top they shoot up and radiate from the bottom. It does not grow so high as the cocoa-nut tree, and the stem is considerably thicker. It bears a nut about the size of an egg, which grows in large bunches, which, from their size, form, and weight, remind one of those ancient Dutch tiles, on which were represented the Hebrew spies bending under the ponderous clusters of the promised land. The oil which is made from this nut is very much superior to the oil of the cocoa-nut. A pint of the former will burn as long as a quart of the latter. The one congeals at a temperature of 72 deg., the other at a temperature of 68 deg. The cahoun tree—which will only grow in the richest soil—abounds in British Honduras, though it is not found in any of the West India islands; and Sir William Hooker informed me that it was not known in Europe until I sent it to this country. Sir W. Hooker planted some of the nuts which I forwarded to him at Kew, two of which have germinated, and are likely to do well. Mr. Faber, the crown surveyor in British Honduras—a very intelligent gentleman, who thoroughly knows the country—thus writes about the cahoun tree :— " By the latest computation the settlement of Honduras contains 37,500 square miles, of which, I do not hesitate to assert, two-fifths are composed of what is commonly called here cahoun ridges (corossales in Spanish). These corossales, or cahoun ridges, are mostly along the tracks of the rivers, and possess the richest virgin soil; some of them are only a quarter of a mile deep, while others extend to from twelve to twenty miles in depth. The cahoun trees grow at an average distance of five yards from one another, thereby forming arches of evergreens, which soften the rays of the tropical sun, and give a majestic air to those forests whose silence is only broken by the titter of bright-plumaged birds, or the solitary cries of some wild animal roaming in these wildernesses. These cahoun trees yield one crop every year ; this crop consists of generally three, and sometimes four bunches of nuts, as close together as grapes ; the nuts are of the size of a small turkey's egg, and on an average there are 800 nuts in one bunch. The people here extract oil from them in the following manner :— When the nuts are what they term full, they break between two stones the shell, which is very hard, then pound the kernel in a wooden mortar ; the sediment is then put into a boiler with water, and boiled down until all the oil, or fat, floats ; they skim the oil off, fry it in an iron pot, so as to disengage all the aqueous particles, and then bottle it. By this simple process the average yield is one quart bottle of oil out of one hundred nuts."

The general manager of the British Sperm Candle Company, Fairfield Works, Bow, thus writes respecting the cahoun oil, in the Society's *Journal* :—

> " I have formed a very favourable opinion of the value of the Cahoun nut oil (of which you were so kind as to send me a specimen) as regards its application to the manufacture of candles. I forward to you herewith a pair of candles which contain 50 per cent of the oil, and having burnt another I find that the light is white and steady. I consider the Cahoun-nut oil superior to cocoa-nut oil for making composition candles, for the odour is more pleasant and the compound is less oily. The best cocoa-nut oil is now selling in London at £2 11s. a cwt., and I think there would be no difficulty in selling the Cahoun-nut oil at a higher rate in very large quantities."

I have received the following testimony to the merits of this oil from Mr. Wilson, the scientific director of Price and Co.'s Candle Works :—

January 2, 1857.

My dear Sir,—We have now the pleasure to send you the results of a few experiments made to ascertain the exact commercial value of Cahoun oil, which we find to be that of the highest quality of cocoa nut oil, that which comes from the Malabar coast, and is selling at the present time at £51 10 per ton. We send you specimens of the oil separated into its liquid and solid constituents, *Coccinine* and *Oleine*, and a little of the

oil made into soap, which has all the very peculiar and characteristic properties of soap made from cocoa nut oil. You may now rely upon Cahoun oil being marketable in this country in *any quantity* at the price of the finest and purest cocoa nut oil.

Yours, &c.,

R. Temple, Esq. G. F. WILSON.

The shell, which is very hard, and admits of a fine polish, might be made use of for various ornamental purposes.

The *Palma Christi*, or castor-oil plant, grows wild in Honduras. When it has once got into your grounds it is almost impossible to extirpate it. The cultivation of this valuable product would not then be a matter of any difficulty, and any amount of the oil could be sent into the British market. Mr. Wilson informed me that he would give from £40 to £50 a ton for as much castor oil as could be sent to him, and he stated that by expending one pound upon every ton, he could make it as good as cocoa-nut oil for the manufacture of candles. The Creoles use castor oil for their hair, the growth and lustre of which they imagine it promotes. Elliot Warburton, in his "Crescent and the Cross," ascribes the luxuriance of the long, dark, clustering curls of the Nubians, to the use of it.

The Cayenne pepper which is made in Honduras is very superior to that which is made in Jamaica, being manufactured of the small red bird pepper, without the addition of any other material. The Jamaica pepper is adulterated with a fine red powder, which is found upon the anotta plant.

The ginger of Honduras is considered to be very good, being singularly free from that fibrous quality which characterises the East Indian ginger, at least that which is imported into this country.

I have already said that where logwood will grow, there also excellent rice may be produced. I sent a specimen of this product of Honduras to this country, and it was pronounced to be equal to the best Java rice.

Much has been said and written of late about the desirableness of producing cotton by means of free labour, and Dr. Livingston has drawn the attention of the public to certain portions of Southern Africa where that article could be grown in perfection. Now, I will undertake to say, that there is no country under the sun more favourable to the cultivation of that plant than British Honduras. In the year 1846 Mr. James Banks read to this Society a paper upon Honduras cotton, when he exhibited a number of specimens. In the published Transactions of this Society, it is stated that "Among the samples exhibited to the Society were the following —from Honduras, the clustered or kidney seed, showing its clustered form and staple, sold at 6d., and valued on trial in 1841 at 6¼d.: also its native cotton, resembling Sea Island, which, when saw-ginned, was valued by the same spinner at 6¾d. The seed of it is almost entirely free from down, and therefore capable of passing easily through the roller gin, and bringing a much higher price. A specimen of the Anguilla, grown in British Honduras, is one of the very finest cottons known. Its seed is entirely free from down, easily separated, and, therefore, readily cleaned by the roller; its seed was the smallest among the samples. There are other kinds (indigenous to Honduras,) which are fine, but covered with down, rendering them difficult to clean, except by the saw process; one kind is of a grey colour; another is red, furnishing the cream-coloured cotton."

It is not necessary, I think, to penetrate into Southern Africa to cultivate a plant by means of free labour, in order to diminish the consumption of that which is produced by the slave, when we are able to grow as good an article in one of our own colonies as that which is imported from the United States.

Tobacco, the narcotic odour of which, it has been said, equally infatuates the ignorant savage and the intelligent philosopher,—tobacco, which solaced the mind of the scientific Newton,—soothed the learned Parr, and taught the fictitious Syntax to bear and forbear when he had returned from his tour with empty pockets, and was soundly rated by his indignant spouse,—tobacco grows spontaneously, and abundantly—in every portion of British Honduras. Tobacco was first discovered by the Spaniards in 1560, in Tabasco, in Yucatan, whence it was sent by them into Europe. Formerly a very extensive trade was carried on between Havana and Yucatan, the latter supplying that city with logwood, salt, deerskins, a fibre from which ropes and hammocks were made, and tobacco. When the planters in Cuba were able, by careful and skillful cultivation, to produce a better tobacco than that with which they had been supplied from Yucatan, that article ceased to be a branch of the trade. It is not to be supposed that the Spaniards, when they discovered the plant, also discovered the use of it. It had long been used by the aborigines, who regarded it with superstitious reverence. It was called yoli by those who dwelt in the islands, and pætun by those who inhabited the continent. There is a considerable quantity of tobacco now cultivated to the north of the Belize river. When the Indians fled from Yucatan to Honduras, they in a very short time proceeded to plant the tobacco, for the Indian still considers that herb as a special gift of the Deity to solace him in trouble, to tranquillise him in prosperity, and to fill him with soft and gentle feelings. He thinks, when he kindles the dried and folded leaf, he is sacrificing to his God,—that every puff of smoke is an incense of adoration, and that the stupor which steals over his senses is the heavenly calm enjoyed by blessed spirits. Very good cigars are manufactured at Merida, the capital of Yucatan, and also at Zacapa, in Guatemala, where they are scented with vanilla. I have no doubt, if knowledge and skill were brought to bear upon the cultivation of this plant, as good tobacco might be produced in Honduras as that grown in Cuba.

In Honduras there is a plentiful supply and a great variety of that animal which first lectured on philosophy—I mean the serpent. Of these reptiles, the number which are venomous is much less than is generally supposed. The snake, possessing no defensive weapon, and having no means by which he can speedily escape from his enemies, is more easily captured than any other animal. But a few of them, although not able to fly from or resist attacks, possess the power of injecting into the veins, and mingling with the blood a deadly venom, which in a few hours destroys life. I say, a few of them possess this power; but as we are not certain which amongst the prodigious variety which exists does not possess it, they are protected by a moral safeguard from the hand of man, which is the undefinable feeling of horror which every one experiences at the sight of any of those creatures. The snakes which are known to be venomous in Honduras are, the rattlesnake, the tomagoff, or tamagasa—as it is sometimes called, and the coral. The bite of the two former causes death in a few hours; but that of the latter, it is said, destroys life almost instantly. There is a plant which grows in Yucatan, in Central America, in Chili, in Peru, in Columbia—indeed, in the whole of South America, which is universally known by the name of Guaco, or Huaco. This is believed and declared to be a certain remedy for snake bites. So strong is the impression of the powerful medicinal virtue possessed by guaco, that no Indian ever traverses the dark and dense forests of that part of the American continent without carrying a portion of it in his pouch. The late Dr. Francis Young, of Belize, thus describes it:—"The guaco is a creeping or climbing plant, growing in moist and shady parts of the forests of Central America, and delights in the rich black vegetable mould so abundant in intertropical forests. It is found in great vigour near the margins of springs, in shady situations, as well as along the banks of rivers. When in its growth it meets with a shrub or any other body, it attaches itself to it by winding in a spiral manner round it. The leaves which have reached full maturity are about six inches in length, and of a proportionate width, and at a little distance from the leaf-stalk are sagittated and serrated. The leaves of middle growth, as well as the young ones, are of a dark purple hue, with a tinge of green on the under surface, an appearance by which the guaco is readily distinguished from other plants of the creeping or climbing kind which may in other respects strongly resemble it. The upper surface is of a green, glossy, and silky aspect, and of a velvety feel, from being covered with a short and exceedingly soft down. The taste of the leaf, stalk, and root is an intense bitter, which leaves a strong impression on the tongue, more lasting than that caused by the generality of bitters."

Dr. Dunglisson, Professor of Medicine in the Jefferson Medical College of Philadelphia, in his book styled, "New Remedies Pharmaceutically and Therapeutically Considered," thus speaks of guaco:—"Many species of the genus Eupatorium, and of the kindred genus Mikania, have been prized in various parts of America, particularly in cases of bites of serpents. This is especially the case with Eupatorium agapana. According to Von Martius, a quantity of bruised leaves is applied to the scarified wound, and the application of fresh leaves is renewed over and over again until the patient is freed from the dangerous symptoms, and especially from the violent suffering; at the same time a few spoonsfull of the expressed juice are administered every now and then." After mentioning a number of plants belonging to the Eupatorium, he says:—"The most important species appear to be that called in Peru Guaco, or Huaco, which is held there in high consideration as well as in New Grenada and Venezuela, not only in these cases but in the prevention of hydrophobia; this is presumed to be the Mikania Guaco of Humboldt."

Very eminent botanists, whose opinions are deserving of the greatest respect, think that the virtues attributed to the guaco and other members of the family of Serpentaria, are purely imaginary. I am not at all qualified to argue that point with them—but the testimony of an honourable, well-informed, and intelligent practitioner of medicine—that the Guaco had been by him administered with success to the human subject in cases of snake bites, is not unworthy of regard. Dr. Francis Young, the gentleman to whom I allude, treated four decided cases of this character, by the application of guaco, with perfect success. The first one was that of a mate of a vessel who had been bitten by a venomous snake, which had been brought on board along with a quantity of logwood. Dr. Young says:—

> "About eight o'clock at night, the mate, while walking the deck, on which a quantity of logwood still remained, suddenly felt something bite him near the ball of the great toe. The pain was exquisite, quickly extending itself in shoots up the limb, and affected his side. There was a giddiness of the head and an acute pain in the pit of the stomach, and sickness. He was almost immediately thrown into violent convulsions, and the posterior muscles of the body became so powerfully affected with spasms as to send the head and shoulders backward to such a degree as to resemble a severe case of tetanus. When my brother, who was hastily sent for, arrived on board, he immediately concluded it was a case of snake bite, and was in the act of sending ashore for the *guaco*, a quantity of which, by good chance, he had, when I arrived with it, having heard of the mishap. At this moment a very violent fit, of an epileptic appearance, with violent spasms of the head, of the kind mentioned above (although greatly aggravated) took place. These spasms had appeared about every ten minutes. We hastily descended to the cabin, and as soon as the power of swallowing returned administered a wine-glass full of very strong tincture of the guaco. We waited in extreme anxiety to see the result of this our first essay in grappling with a formidable enemy hitherto accounted invincible, with a power, new to us, indeed, but the fame of which was widely spread. It may well be imagined how great was the intensity of our impatience in awaiting the lapse of the usual period intervening betwixt the convulsive attacks. Ten, twenty, thirty, and forty minutes over without any return of the convulsions. The pulse was strong, full, and accelerated—there was much pain in the head, with somewhat of drowsiness, and a profuse flow of perspiration. We left the patient, ordering the same dose to be given in about an hour and a half after the first dose, should no convulsion appear, but immediately on a threatening of such. About a quarter of an hour after we left a slight convulsive attack came on, when the dose was repeated. As we had left orders to be sent for should matters again become unfavourable, we were agreeably surprised to pass the night without being called, the last attack being so slight as not to appear to his father sufficiently serious to cause him to disturb us, more especially as he was satisfied he had a sufficient remedy with him. The young man in a day or two was quite well. I may here observe that the snake was neither seen before nor found on board afterwards, it having in all probability slipped over the side of the vessel after inflicting the wound. No one, however, ever expressed a doubt as to the identity of the bite with the snake which had so cleverly evaded the boat's crew.
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> "The other three cases occurred to two Indians and a Carib, and were treated in the same manner. In all, after giving guaco, the pulse became exceedingly strong and full, with intense headache and flushed countenance, followed after a time with a profuse flow of perspiration. These symptoms would doubtless have led me to the free use of the lancet, had I not previously reflected well on the treatment I should adopt. A strong tincture was used and given by the wine-glass full. It might be said that the quantity of spirits would of itself account for all the symptoms which manifested themselves after the exhibition of the guaco, but when it is mentioned that the whole of the last-mentioned sufferers were in the almost daily use of drinking large quantities of spirituous liquors, this surmise becomes dissipated. I have not a doubt upon my own mind that the symptoms were produced by the guaco, and as the necessary results of an internal exhibition, in whatever form given, provided the dose be large, and given with a bold hand, and that previous depletion, either by the lancet or otherwise, had not preceded its use. I, moreover, am of opinion that the entire success of the treatment arose from the action of the guaco on the body not having been interfered with, or in any way modified by a random recourse to the lancet, without reflection that its use might altogether destroy the efficacy of the peculiar power admitted to reside in this singular plant. * * * The guaco is frequently used in intermittent fever instead of bark or quinine, and as a good stomachic in dyspeptic or debilitated state of the intestinal canal."

George Byam, the author of "Wild Life in Central America," after telling us that a friend with whom he was talking near the coast one day, informed him of the extraordinary virtues of the guaco in the cases of bites by venomous reptiles, says, "he was not then aware how soon his remedy was to be tested. Seeing one of the Indians attached to his plantation idling about, he told him to go and remove some loose timber that was lying near an outhouse, and put it under shelter. The man came back in a few minutes, looking more like a blue Indian than a red one, and having only time to say, he had been stung, dropped down in a sort of fit. My friend said, it must have been done by a snake, but a bottle of the tincture was quickly brought out, and about a wine-glass full poured down his throat: he was then laid on a bench and covered up with a poncho, and in a few minutes he burst out into a profuse perspiration, and fell asleep. 'All right,' said my friend, 'he is all right now,' and several men having collected, we started off to kill the snake that was supposed to have bit him. On turning over the piece of wood he had been raising, we found not a snake, but the largest and blackest looking scorpion any of us had ever seen before. Having secured it alive, we brought it into the house and put it under a bell glass to observe it; it must have been six inches long and had claws as large as those of a small fresh water cray fish. The man awoke in a couple of hours quite well, but rather weak from the violent perspiration occasioned by the dose."

Guaco is also said to be a remedy for cholera.

Several months ago, I stated in a letter published in the Society's *Journal*, that there was an odoriferous substance in the axillary glands and under the jaw of the alligator, which might be used as a substitute for musk, and thereby become a valuable article of commerce. In going up or down the rivers of Honduras you are always warned of the presence of an alligator, by a strong and sometimes almost overpowering smell of musk.

Two hundred years ago the musk of the alligator of Yucatan and Honduras was extracted from that animal. Captain Dampier says, "The flesh smells very strong of musk, especially four kernels, which are always found about them, two of which grow in the groin, near each thigh, the other two at the breast, one under each fore leg, and about the bigness of a pullet's egg; therefore, when we kill an alligator, we take out these, and having dried them, wear them in our hats for a perfume."

An extract from the "Official and Descriptive Report of the Madras Exhibition of 1855," shows that the musk of the alligator is known and appreciated in the East Indies. It is as follows, "The largest animal found in the backwaters is the alligator. This vicious animal is sometimes very destructive to those who travel in common canoes, and is found in the northern districts (of Travancore) measuring from 20 to 30 feet in length, and from 5 to 8 feet in girth, and 10 feet in circumference. Musk is taken from the glands of the jaw, which is very fine if well prepared and separated from the flesh, otherwise it will give a very bad smell." But the presence of this famous perfume does not alone constitute the value of the alligator. The teeth of that animal are from four to six inches in length, and are very white and hard. There is no doubt that they might be applied to many useful and ornamental purposes. But there is still another article of no slight importance, which may be extracted from that amphibious brute. The tail of an alligator, measuring twelve feet in length, when boiled down, gives from 60 to 80 pounds of excellent oil. These various materials render that animal much more valuable than it was supposed to be in the days of Romeo, when "starved apothecaries, to show that learning and not beef was their aliment, hung up in their 'meagre repertories' alligators stuffed." The alligator of the New World is a timid animal on land, but in the water he will always attack man. It is not able to bite off a leg, as the shark does, not having the incisors which that fish possesses. He has only the canine and molar teeth, and consequently can only tear his prey. Two of remarkable length grow at the end of the under jaw, in the smallest part. There are two holes in the upper jaw to receive them, otherwise he would not be able to shut his mouth. It generally comes on shore at night, and attracts to him pigs, and dogs, and goats by an exact imitation of the respective cries of those animals.

The Queen conch abounds in the shallow waters which cover the numerous coral reefs near the coast of Honduras. The shell of the Queen conch is extensively used for the manufacture of cameos. In a paper read to this Society in April, 1847, by J. E. Gray, Esq., it was stated that in the year 1846, 12,000 of these shells, valued at £725, or 1s. 2½d. each, were sold in France for this purpose. From a Queen conch one good-sized cameo brooch can be made, and several shirt-studs. The Queen conch frequently contains a pearl, which is extremely beautiful. It is sometimes white, and sometimes of a light pink colour. The latter is the most esteemed.

All those materials for fibre which grow in Jamaica and the other islands, such as the plantain, the banana, the penguin, and the aloe, Honduras produces in great abundance. But there are two vegetable products which I believe are confined to British Honduras, Central America, and Mexico. One is called the *Agave sisilana.* Of this ropes, mats, hammocks, and coarse sacking is manufactured; the other, called the Pita broumelia, ixtle by the Mexicans, and silk-grass by the Creoles of British Honduras. This plant grows spontaneously in the greatest abundance. The leaves are soft, dark green, from five to twelve feet long, and from an inch and a-half to four inches wide. Along the edge of the leaf, at a distance of about six inches from each other, are short, sharp, curved thorns. When the plant is cultivated these thorns gradually disappear. The fibre which this leaf contains is unquestionably of a very superior description, and I have no doubt could be used in the manufacture of every species of textile fabric. Mr. Pye, of Ipswich, has informed me that this fibre is equal to the best China-grass—is superior to the New Zealand flax—and is capable of being manufactured into the finest fabrics. Major Barrow, United States engineer, in his book on the Isthmus of Tehuantepec, thus speaks of it:—"Among the spontaneous products is the *Broumelia pita,* or *ixtle* of the Isthmus, which differs in some respects from the *Agave Americana* of Europe, the *palgue de malguey* of Mexico, and the *Agava sisalana* of Campeachy. Of this prolific plant there are numerous varieties, all yielding fibres, which vary in quality, from the coarsest hemp to the finest flax. Nor is the value of the plant diminished by its indifference to soil, climate, and season. The simplicity of its cultivation, and the facility of extracting and preparing its products, render it of universal use. From it is fabricated thread and cordage, mats, bagging, and clothing, and the hammocks in which the natives are born, repose, and die. The fibres of the *pita* are sometimes employed in the manufacture of paper; its juice is used as a caustic for wounds, and its thorns serve the Indians for needles and pins."

The india-rubber tree is a spontaneous product of Honduras. This tree grows to a very large size, and it is dispersed over the whole country. When an incision is made in the bark, a thick milky fluid gushes out, which in the course of a week becomes black and solid. The woodcutters frequently have recourse to it. When an accident occurs to those habiliments which, since the fall of man, it has been customary to wear in civilized countries, the owner, instead of resorting to the ordinary method of needle and thread, makes a gash in an india-rubber tree, and with some of the inspissating juice which immediately rushes out, he plasters up the chasm.

There is a tree in Honduras called the mammee. It is a tall straight tree, spreading at the top, and having long, dark green leaves, the under surface of which is covered with a soft down. It bears a fruit about the size of a cocoa-nut when it is denuded of the husk. The rind of this fruit is rough, and of a pale brick colour. The inside is soapy, of a yellowish pink colour, and tastes like a mixture of tar and molasses. It contains a large oval seed, of a dark brown colour, and highly polished, the kernel of which has a strong flavour of prussic acid. The Indians cut the kernels in small pieces, roast them, and mix them with their chocolate; some eat them alone. It is said to be agreeable, nutritious, and sedative. An infusion of the dried leaves is a powerful narcotic. An infusion of the bark is a narcotic and a tonic. The Indians of Tehuantepec extract an oil from the kernel, which they apply to their hair, and to which they ascribe certain medicinal properties, but what they are I have not heard. The flowers of the trees are used in flavouring a liqueur made in some parts of the West Indies, called *Crême des Creoles.*

That valuable plant ipecachuana, the root of which is so extensively used in medicine as a powerful but harmless emetic, and which is a principal ingredient in the Dover's powder, is also indigenous to Honduras. The flower is seen growing on the roadside and in the pastures, as the daisy and the dandelion in this country.

The silk cotton tree is a native of Honduras. It grows to a prodigious height,—is widely spreading, and is covered, when in blossom, with most beautiful flowers. These flowers are succeeded by green pods, from four to six inches in length, which contain a grey cotton, which is extremely soft and silky. This material I think might be used for covering hats.

There is no country in the world in which better rice could be grown than Honduras. The nature of the greatest part of the land near the sea coast is low and moist, and, consisting of a rich, black, unctuous, vegetable mould, is peculiarily adapted to the production of rice.

I have said that the cochineal, indigo, and sarsaparilla which are shipped at Belize are not the produce of Honduras,—but of the Central American States. Cochineal or *coccus cacti*, from the Greek word Κοκκος, because it was thought at one time to be the grain or seed of the cactus,—called by the Spaniards *Cochinilla*, is confined entirely to Guatemala. The cochineal is a small insect, which feeds only upon the cactus. It was introduced into Guatemala in the year 1811, by Don Jose de Bustamente, from Oaxaca, in Mexico, of which he was Captain General, when he was removed from that province to the former state. It was formerly exported to Cadiz, but since the independence of the Central American States, the whole of it has been sent to England by way of Belize. It is packed up in hides, each bale being called a seroon, and containing 150lbs. The demand for this beautiful dye has very much increased of late years. In 1827, 100 seroons were exported; in 1830, 300; in 1831, 700; in 1846, 9,037; and in 1849, 9,794. The price 20 years ago was 10s. 6d. a lb. It now varies from 3s. 4d. to 4s. 9d. for silvers, and for blacks from 3s. 6d. to 5s. 8s. The black cochineal, which is considered the best, is the insect which is dried after it has ceased to breed. The silver is that which is dried before it has begun to breed. Mr. Dunlop, in his "Travels in Central America," states that there are five varieties of the cactus which have been tried in Central America for the propagation and sustenance of the cochineal. The "penka beaver" (hedge cactus), the penka amarilla, or yellow flowering cactus, the penka blanca, or white flowering cactus, the "mosote," having a bright crimson flower, and the costanea, which has also a red flower. Of these five descriptions of the cactus, the mosote is preferred, for a plantation of this cactus will last 12 years, and yield two crops a year. The insect is preserved during the winter upon the leaves of the cactus, in long narrow buildings erected for the purpose. At the commencement of the dry season, which is in October, the insect is placed upon the leaf; and at the expiration of 90 days, when the mother cochineal has done breeding, and the young insect is sufficiently mature, they are taken off and dried in the sun. The different descriptions of cactus which I have mentioned grow as well in Honduras as in Guatemala, and there is no reason why the cochineal insect should not be also produced there. All that is required is dry weather while the insect is breeding and feeding upon the leaf. A heavy shower of rain would in an instant wash the cochineal from the leaf. From the beginning of March until the end of May, scarcely a drop of rain falls in Honduras. During that period the cochineal might feed upon the cactus in perfect security. It is extremely probable that the climate of Honduras would be more favourable to the cultivation of this insect than even Guatemala, for in the latter State the nights are often very chilly, which is not the case in the former country during the dry season. The insects are often destroyed by the chill, cold, night-air of Guatemala.

Sarsaparilla, the medicinal properties of which are so valuable, is a native of British Honduras. At the present moment the whole of the sarsaparilla which comes from Belize grows in the republic of Honduras, although the seamen, when they bear upon their backs bales of this article to the boat at the sea-side, which is to carry them on board the ship bound for England, which is riding at anchor in the bay, pass by this very plant which is growing wild, and which ignorance or apathy leaves to wither unregarded.

A very considerable quantity of indigo passes yearly through Belize for England. This comes entirely from San Salvador, and is the only article exported from that state. Previously to the independence of the Central American States, a very considerable quantity of indigo was produced in San Salvador, but, since that event, the cultivation of it has gradually declined. In 1820, the quantity produced amounted to 8,323 bales, but in 1846 the quantity did not exceed 1,200. The plant which is cultivated in San Salvador is a triennial, but there is another species indigenous to the country, which is a perennial. The latter plant produces a dye very superior to the former, but it only yields about half the quantity. In British Honduras the forests are full of this indigenous plant, and there is not the slightest doubt, if it were properly cultivated, and science and skill were brought to bear upon the manufacture of the dye, that country would produce an article equal to the best Bengal indigo.

The moringa tree, from the seeds of which the celebrated oil of Ben is said to be made, grows readily. Digitalis, or fox-glove, is found in the high lands.

The fustic, a large tree, from which a yellow dye is procured; the brazilletta, or Brazil wood, which gives a crimson dye; *Pterocarpus Draco*, from which dragons' blood is derived; the *Dolichos pruriens*, or cowhage, which is used as a vermifuge; the contrayerva, which is valuable for its tonic properties; vanilla, so much used as a scent, and for flavouring confectionery; cacao, from which chocolate is made,—all these vegetable products grow in wild profusion in British Honduras. To mankind they are of no use; to man, ungrateful to his Maker for his varied and exhaustless bounties, they are like the rose which is—

> "born to blush unseen,
> And waste its sweetness on the desert air."

In the district to the north of Belize, excellent sugar and rum are produced, and there is no locality in the world where better coffee could be grown than in the Manati hills and the Cockscomb mountains. The mulberry tree flourishes, and the silk-worm could be cultivated with success.

All this vegetable wealth,—all these varied resources, the Honduras merchants are well aware of; but so long as our position in the country is uncertain, so long as we are threatened to be expelled,—so long as our American friends keep firing off against us Clayton and Bulwer treaties and Monro doctrines, they consider that it would be too great a risk to embark much capital in the general trade of that country.

But the Central American question is now, happily, set at rest by the last treaty between this country and the United States, and any one who attempts to disturb the good feelings which dictated its amicable adjustment, will display neither patriotism nor good sense.

I have so far confined my observations to the vegetable resources of Honduras; and of them I have only mentioned those which were the most prominent. It has numerous valuable woods—the iron-wood, the sappodilla, the red pine, button-wood, the dogwood, the cedar, the ziricote (of which there is a specimen upon the table), the mohoe, the red mangrove, the Santa Maria, the sea grape, and a host of others, extremely valuable, which I must abstain from noticing at present. But there are many animal productions which deserve to be ranked amongst the commercial commodities of this country. Turtle, tortoiseshell (which is the shell of the hawksbill), the roe of the calipever, equal in all respects to the roe of the sturgeon, and the sterlet which comes from Russia, the liver of the hiccattee, the oil from the tail of the manati, the eggs of the iguana, the scales of the tarpaum and the calipever, the jew-fish from the thick, gelatinous skin, bones, and fins of which, isinglass might be made, and many others, which I have not time to notice.

There is no question that Honduras is destined before many years have elapsed to hold an exalted rank amongst our colonies. That grand conception, the Honduras interoceanic railway, which, when finished, and I have no doubt it will be finished, will confer immortality upon its projectors, will give new life to British Honduras,—it will launch into it fresh energy, skill, intelligence, and capital: and it will bring into high relief the great mercantile capabilities which it possesses, and place it in that position, commercial and political, which by right it ought to occupy. Telegraphic communication will be established between London and Havana within the next year. It is the intention of the Honduras Railway Company to lay a wire from Havana to Cape Antonio, from Cape Antonio to Belize, and from Belize to Puerto Caballos, the Atlantic terminus of the line.

I have now placed before you a sketch or outline of the history, trade, and commercial capabilities of Honduras; and although my task has been imperfectly performed, you will, I am sure, feel satisfied that Honduras is deserving of more attention than has hitherto been bestowed upon it, and now I would beg permission to say—if the spirit of adventure animates you—that spirit which moved a Columbus, a Magellan, a Vasco de Gama, and a Cabot—do not now waste your energies and throw away your time amidst the icebergs and eternal snows of polar climes, in the solution of problems which have been already solved—do not wreck your fortunes and risk your lives in explorations, the only fruits of which will be the stranded boats, and whitened bones, of the gallant men who preceded you in that perilous path, but direct your exertions to the development of a country, which teems with every species of animal and vegetable wealth, by which you will not only benefit yourselves, but contribute to the wants of your fellow man—by which you will not only be the architects of your own fortunes, but the benefactors of mankind.

DISCUSSION.

Mr. Tanner Owen Clarke said that, having spent several years in the West Indies, and being still connected with some of those colonies, he could speak with some confidence, and bear concurrent testimony, were it necessary, in confirmation of the views which had been so ably advanced by the hon. and learned author of the paper. There existed, however, a great and paramount evil, and until that was remedied, or in a great measure mitigated, he saw very little hope for the resuscitation of our West Indian Colonies, or of the realisation of those commercial effects which the learned author so much desired. That evil was the want of labour. In many of our colonies the relative position of master and labourer was reversed—the servant, in fact, occupied the position of the master, and it was only with the greatest difficulty that any labourers could be obtained. Were there an adequate supply of labour—free labour,—there was no reason why the numerous products of those countries might not be cultivated with advantage. He thought a well-advised system of continuous, self-supporting emigration, under proper guidance and supervision, was the desideratum for the resuscitation of those colonies. Of all the natural products of the West Indies, none perhaps were more valuable than the oleaginous fruits and seeds indigenous to the soil, and almost unlimited in quantity. These, even under existing circumstances, might be cultivated to a profit. Acting upon that impression, he had sent out instructions to his agent in Jamaica to commence an experiment on a small scale with the cultivation of the "moringa," which had been spoken of by the author of the paper. He had brought with him a sample of the seeds and the oil produced from them, and he read the following report upon the seeds of the *Moringha pterygosperma*, by Mr. Dugald Campbell, Analytical Chemist to the Brompton Hospital, London:—

"The seeds, as they are received by me, weigh on an average 4¼ grains each, and when they are divested of their husk and shell, leave a small pith-like substance, about the size of a pea, weighing as near as may be 3.07 grains, which is a yield of 72.27 per cent.

"This pith-like substance is composed of oily matter, saccharine matter, with other vegetable substances, besides mineral salts and water, and in the following proportions in 100 parts:—

Oily matter...	36.83
Saccharine matter	8.28
Other vegetable substances	44.17
Mineral salts	3 92
Water...	6.80
	100.00

"Although I have obtained by exact chemical processes 36.83 per cent. of oil, the modes of analysis which I was necessitated to adopt in order to estimate all the oil in the seed are too expensive in their operations for commercial purposes, and could not, on that account alone, were there no other reason against their use, be applied to extract the oil from the seed.

"To test, however, what would be the practical yield of oil, a quantity of the seeds were deprived of their shell, and in this state 5lb. weight were enclosed in a horse-hair bag—the usual custom in such an operation—and submitted to hydraulic pressure for nearly three days in a room kept at about the temperature of 80° Fah.

"The product thus obtained, after filtering once through ordinary bibulous paper, was a rich, fatty, bright, clear, rather deep straw-coloured oil, weighing 1lb. and ¾ths. of an ounce, or 20.93 per cent. of oil to seed deprived of its outer shell.

"This oil is the opposite to a dry oil, being extremely rich in fatty substances, and is of specific gravity 915.60 at 60° Fah. water taken as 1,000°. When it is kept cooled for a short time at 44° it soon becomes opaque from crystals of the fatty substances forming throughout it, and it is now very viscid and thick. In this state it may be heated up to 65° before it assumes its original brightness, although it may when above that temperature be gradually cooled down to below 50° without any change being perceived; it is nearly tasteless and almost without odour; any odour, however, which it may have is suggestive of the dahlia.

The practical operation gave results as follows:—

Clear oil as described above	20.93
Cake	76.26
Loss in the operation	2.81
	100.00

"My opinion of the oil is, that it is highly rich and valuable, and applicable, by reason of its qualities above described, for very many purposes, but I have not gone into a perfect chemical analysis of it, although I would be happy to do so were you to wish it.

"The cake, the residue in the press after the operation, is a valuable substance and may be applicable in more ways than one; its full examination and applications, however, are reserved for your consideration, but its examination, so far as I have gone, has led me to the following results in 100 parts:—

Oil remaining in cake	17.90
Saccharine matter	11.24
Other vegetable substances	57.18
Mineral salts	4.96
Water...	8.72
	100.00

"As many substances yielding fat oils contain essential oils likewise, I may suggest as an instance of this the bitter almond. I deemed it necessary to make an examination of the cake in this direction, but although the experiments were carried on to their fullest extent, I was unsuccessful, and got no essential oil from it.

"The great value of oil cakes is in their properties of feeding, the present value of best linseed cake here is, for American, £12 10s. per ton, English £12, and French £11. Rape cake has been found to be inferior in feeding qualities, and its price is about £7 per ton.

"I am not aware that physiologists can decide, from chemical data, wherein the difference between these two substances in power of feeding exists, their chemical composition is not so dissimilar as to suggest speculation in this direction. The element which physiologists and chemists agree in considering one of the most vital importance in the system is nitrogen, but this exists in linseed and rape cakes as near as may be in the same proportion, and hence, although a good deal may depend upon this element in the feeding process, still it would appear that the difference in the feeding power between these two substances does not depend upon this alone. If this were the case and that the nitrogen was the great element, the cake which I have obtained from the seeds would stand pre-eminent, for linseed and rape cake contain on an average from 5 to 5½ per cent. of nitrogen whilst it yields 7¼ per cent.

"The first impression to the palate on tasting the cake is one suggestive of a sweet principle, but which, however, is cursory and yields to the flavour of a bitter principle, and although I have ascertained that the sweet taste is from sugar, and I have likewise estimated the amount, as may be seen on referring back to the partial analysis of the cake, I have not, however, determined or even eliminated the bitter. Many of these bitter principles are very nutritious and likewise many are the reverse, nay even poisonous. Should no deleterious matters exist in the cake, from the chemical examination I have made, I am able to say it possesses elements which place it, according to all views in physiology, superior in feeding power to the finest linseed cake. Should, however, this cake be found deleterious as a feeder its value as a manure is considerable, and from the amount of nitrogen it contains, comparing it with Peruvian Guano, and allowing 10s. per ton to the cake for the more favourable condition of the nitrogen in it over the guano, it would meet a ready sale now in the London market at £6 per ton.

"From your information I am aware that the seeds which I have been operating upon are growing without cultivation, and there cannot be a doubt but that the yield of the oil would be, to a very great extent, increased by the culture of the plant, and so likewise would the saccharine principle, whilst the cake would be slightly deteriorated in value as a manure, for it is a rule, as far as I have observed, in most plants, that cultivation, whilst developing the non-nitrogenous substances, if it does not depress the nitrogenous, at least in no way assists in increasing them.

"Should you deem it necessary for me to proceed further with the investigation of the seeds upon any of the properties to which I have called attention, I will be happy to do so."

Mr. Clarke went on to remark that there was no fear of overstocking the market with oil, even if the quantity brought in were double or ten times the present amount. Mr. Clarke also produced a sample of the antidote cocoon nut (*Fevillea seccuderes*), the kernel of which, he said, when prepared like coffee, so far as flavour was concerned, was an excellent substitute for that article. It was, however, supposed to be provocative of dropsy. It was, nevertheless, used by the negroes in sickness, and also in lieu of candles, as well as an antidote in many cases of poison.

Mr. Sheriff MECHI spoke in reference to the cake of the castor-oil plant. He had been furnished with some of it, with which he dressed some growing crops of wheat. He had no doubt the cake of the castor-oil plant produced very excellent results as a manure, and increased the crop very considerably.

Mr. P. L. SIMMONDS said that he could fully corroborate the observation that there was an almost unlimited demand for vegetable oils for manufacturing purposes. It was but on Monday, in a leader in the *Mark Lane Express*, that he had called attention to the growing wants of commerce for oil, for while our imports of animal fats were almost stationary, the supply of vegetable oils had more than doubled in the last 10 years—a strong stimulus having been given to importation by the abolition of the duty on oil, and on the manufacture of soap, while the large production and consumption of composite candles led to an extra demand. Indeed, oils of all kinds were in great request; whether they consisted of the new Cahoun oil (introduced into notice by Mr. Chief Justice Temple), the castor oil, oil of Ben—used chiefly, he believed, by watchmaksrs—palm oil, or any other of the numerous oils with which the tropics abounded. Much as he desired to stimulate the production of oil-cakes, whether for feeding purposes or for manures, he feared the refuse, after expressing the oil from the moringa, would be very limited; and it would be long before any appreciable supply could be obtained. He trusted it would be the means of bringing the locality more prominently into notice among our merchants and capitalists, and obtaining for it the Government recognition and establishment as a colony. This, with the question of labour alluded to by Mr. Clarke, as the essentials requisite for its advancement Among the vast range of products incidentally or specifically mentioned by Mr. Temple, fibrous materials were among the most important. At a lecture, on Monday evening, he (Mr. Simmonds) had gone somewhat elaborately into our increasing demands for cotton and other fibrous substances, and our dependence upon the United States for our supply of cotton, while it could be produced in abundance in our various dependencies. The subject was prominently taken up yesterday in a leader in the *Times*. The beautiful specimens of cotton and fibre produced that evening showed what could be done in the neglected district of Honduras. Formerly, our West Indian and American possessions, British Guiana, Jamaica, Barbadoes, Bahama, &c., supplied us with considerable quantities of cotton, while they now scarcely produced any. But there were numerous wild plants of the Broumelia and Agave and other tribes, as well as the palms, from which fibrous material for many useful purposes could be obtained. He had seen that day some indigenous specimens of the penguin or bromelia, and other fibres from Honduras, which had been operated upon by a new patented process, by Messrs. Pye, Brothers, of Ipswich, and he was astonished at the remarkable improvement in the quality and the high commercial value given to this article. The main difficulty that had stood in the way of the utilising many of those fibres, was cheap machinery for preparing them, and the getting rid of the various and gummy matters by which they were surrounded, without injury to the fibre. This was now effected, and he foresaw great benefits to the colonies and to our own manufacturers at home therefrom.

Mr. PYE said, that his name having been mentioned by the Honourable Chief Justice in his paper in connection with the commercial value of one of the fibres exhibited in the state in which it was used by the inhabitants of British Honduras, and having been also alluded to by Mr. Simmonds with reference to other fibres, the produce of our possessions, he deemed it due to the Society, to state how he had been able to give such a decided opinion upon the merits of the fibre in question—the "Pita broumelia" or silk grass. The Chief Justice had sent to him a specimen of this fibre to test its commercial and spinning qualities, and he (Mr. Pye) then produced it in a state fit for manufacturing purposes generally. On the authority of practical men, he could confidently assert that this fibre, from its strength and quality, might be rendered fit, by the heckling process, for the finest fabrics. Incidentally he would remark that the specimen given to him contained, by accidental contact with some strong gum—much of that substance—a matter perfectly foreign to the plant itself—thereby increasing the difficulty of its purification from its own natural gums. This combination of gummy matters was a severe test of the efficacy of his (Mr. Pye's) process, and the specimen he then produced showed how perfectly his system had acted in producing a pure and and valuable fibre. Mr. Simmonds having alluded generally to the fibrous productions of India, both east and west, he trusted that he might be permitted to mention that the numerous plants and grasses, classed commercially as hemps, were readily and effectually treated by his process (which was simple and speedy in its operation, and of little cost). He had from them produced pure and valuable fibres, possessing great strength, and capable of conversion into the best ships' cordage and canvas, and many of them into the finest fabrics.

Mr. J. B. SHARP said that he could confirm all that had been said by Mr. Pye and Mr. Simmonds; and with regard to the silk grass, to which especial reference had been made, and which, although not exclusively the growth of Honduras—since it was produced in British Guiana—was not of general growth in the West India colonies, he had that morning submitted some of the fibre to close microscopical examination, and had ascertained, as might have been expected, that each fibre consisted of from six to twelve, or more, fine filaments, held together by a gummy matter, capable of being dissolved, which would bring the material to the same perfect state as two of the specimens he had laid upon the table. These had been passed over the combs or heckles of a flax mill, and had been pronounced, by the most experienced flax-spinners of the North, to be greatly superior to Russian flax, and approaching the best description of Belgian, in capability of application to the finest textile fabrics. These two specimens were of altogether different plants from the silk grass, and partook, with it, of the valuable qualities of great fineness and strength. A material point to be considered was the machinery to be employed in obtaining these fabrics; and the scarcity and cost of labour in Honduras rendered such means of superseding manual labour essential. On that head he would observe, that the plantain, one of the most luxuriant plants in growth, could be easily prepared by one machine; whilst the silk grass, which was of the genus *Broumelia*, together with the penguin, or wildfire, the aloe, and numerous others, required a machine essentially different in construction. The leaf of the silk grass consisted of two different structures, the upper side being of a soft or pulpy character, easy of removal; and the under side of a harder or more ligneous character, and more difficult to separate, these two external bodies holding the fibre between them. The preparation of the fibre was, however, a mere question of mechanical arrangement; and in a few weeks he would be able to show the hon. and learned Chief Justice machines adapted to all those purposes. Mr. Sharp then stated that he quite concurred in the opinion that the interests of the colonies had not met with that support from the home authorities to which they were entitled; and he had no hesitation in stating that two of our West India possessions, the Island of Jamaica and the colony of British Guiana, to which he would add Honduras, were capable of furnishing these fibres, in their various kinds, to the amount of three millions sterling per annum. He had been severely attacked for advocating the cause of the colonies in preference to Russia and other foreign countries, with respect to supplies of fibrous matter. But he would plainly avow, that he was sufficiently an Englishman, and sufficiently patriotic, to prefer the interest, the welfare, and the prosperity of our colonial possessions, and of our fellow-subjects engaged there, to those of any foreign country whatsoever.

Mr. Routledge said, with reference to the machines which were exhibited before the Society on the 28th November, for expressing the fibres of plants, he had received a letter from Mr. Burke, of Montserrat, stating that both the large and the small machine had been used there with the most satisfactory results. Samples of the fibres so manufactured would, on a future occasion, be submitted for the inspection of the Society. Machines had been brought out to test the matter upon a proper basis, and within a month from that time 20 or more machines would go out to India. Thus the fibre question would very soon be settled.

Mr. Trelawny Saunders said, there were two points only to which he would allude. The first was the geographical question, and the second was the administrative question. With regard to the former, he thought the delineator of the map exhibited had been sufficiently modest in fixing the boundaries of this province from the Hondo to the Sarstoon. The actual frontier must remain in uncertainty until the enterprise of some parties should carry exploration and survey into the interior, so as to determine a question of considerable importance where every inch of territory was of the productive character they had heard described. With reference to the administrative question, he would remark that it could never be expected that much would be done in the shape of agricultural operations in these colonies until the question of title to the land was placed upon a more satisfactory basis. The government proceeded upon no fixed principle in matters of that important character. It often happened that in the first instance private interests grew up until they became of sufficient importance to force themselves upon the attention of government, who met the demands of those interests as expediency suggested. That was the conclusion to which he came from witnessing the operations of government in some of our growing colonies. He thought in this respect they might take a lesson from their brethren in the United States, and follow their example with regard to the occupation of new territories. Their plan was to establish a government office for the allotment of the land at a set price. Where sufficient attractions were offered settlers would speedily follow. With reference to the complaint they had heard of the indolence and indisposition of the negroes in Jamaica to work, he did not blame them for it. They would not work unless they were duly paid, and there was not sufficient inducement in the wages which the colonists could pay. It was not so much a place for capital as for free and independent labour; and that could only be procured by granting a secure title to the land.

Mr. G. F. Wilson, F.R.S., said that he hoped this very valuable paper would lead to the products of Honduras being more fully explored and brought into commerce. If any gentleman was incited by it to undertake the manufacture of cahoun oil, he need be under no fear of glutting the English market, nor that the supply of all that class of butters and oils was not keeping pace with the constantly increasing demand, and there would be no fear of any quantity of cahoun oil not meeting with a ready sale at the price of the finest cocoa-nut oil. The moringa seed, better known as the oil of Ben, which had been spoken of, had long been used in small quantities in this country, and was a valuable bland oil, with a low congealing point. When the commercial exploration takes place it would be well to collect, in addition to the palm and the other known butter and oil seeds, all other seeds which on being burnt would show any considerable light-giving properties. In all tropical countries where he had had the means of collecting information, there were found many varieties of tallow, butter, and oil-yielding seeds, some of which, when untried, would appear only woody and hard, but which yielded hard tallows, and from their high melting points were capable of being substituted for even the hardest descriptions of animal tallow. Caster-oil could now be used in very large quantities for manufacturing purposes, and at the present high rate of oils it would sell readily at above £40 a ton.

Colonel O'Connor said, had he not been requested to do so, he should not have taken the liberty of obtruding any observations of his own in confirmation of what the learned Chief Justice had stated. But the experience of three and a-half years' residence in Honduras, and the having travelled through a considerable portion of Central America, added to some experience in Africa, enabled him to state that the subjects brought forward by the learned Chief Justice were of the greatest importance. The Chief Justice had thrown light upon a colony which had been long kept in the shade; and it was only matter of astonishment that the subject had not been sooner brought forward. He considered they were greatly indebted to the Chief Justice; and looking at the important service he had rendered to the colony itself, he (Colonel O'Connor), as Governor of one of her Majesty's colonies, hoped he would receive that reward which he so richly deserved.

The Chairman said his duties that evening were light, being rather to elicit discussion from others than to take part in it himself. He had, however, one pleasing portion of his duty still to perform, that of inviting the meeting to give their warmest thanks to Mr. Chief

Justice Temple, for the very valuable and interesting paper with which he had favoured them that evening. All must be greatly indebted to that gentleman who, while in this country for relaxation from his arduous duties as Chief Justice, had devoted his leisure to the making known the value and importance of the settlement about which he (the chairman) was sorry to say in this country they knew very little. In bringing forward this information, and showing the almost untouched field for capital and labour which existed there, Mr. Temple was not only benefiting British Honduras, but British commerce. He would not detain the meeting any further than formally to propose the vote of thanks for the paper read to them that evening.

A vote of thanks was then passed to Mr. Chief Justice Temple.

The Paper was illustrated by a great variety of specimens of the products of Honduras, among which were several varieties of cotton, cahoun palm nuts, cahoun oil, and candles manufactured from it, the ground nut, castor-oil seeds, the moringa pods and seeds, the zericote wood, snake root, &c.

The Secretary announced that on Wednesday next, the 21st inst., a Paper by Mr. E. G. Squier, "On the proposed Honduras Interoceanic Railway," would be read.

Home Correspondence.

DRYING OILS.

Sir,—Mr. Binks's method of treating linseed oil, as described in your paper of the 5th inst., will, if founded upon a correct basis, commend itself to every unprejudiced mind, inasmuch as it excludes the necessity for using sulphuric acid, thus supplying a remedy for a great evil, not only in reference to painting in general, but also as regards the artistic world.

By means of the injection of sulphuric acid, followed by steam, almost all such oils, good, bad, and indifferent, have been mixed together by almost every crusher and large consumer, thereby injuring their protective property and deceiving the public at large.

In London, where the external stucco is so universally painted, the difficulty has hitherto been to account for the blackness which so frequently comes upon the painted surfaces, but now that the use of inferior oils saturated with sulphuric acid has been brought to light, the mystery is solved. Of course, if the oxide of manganese be rot completely separated from the oil, the painted surface may still acquire colour, viz., that of a brick red, which would be almost as objectionable. Perhaps Mr. Binks can prevent this, but as white lead is the pigment which forms the basis of most colours, it is equally important that its manufacture should also be attended to, as there is only one variety of carbonate of lead suitable for paint, *i.e.*, carbonate of lead devoid of constituent water. This variety is soluble in linseed oil, and in a manner is in a state of chemical union with it. The varieties of carbonate of lead formed from precipitation always contains water (constituent), or of crystallisation incapable of entering into union with the oil. Hence its want of durability; and moreover, from its transparency it does not cover; the consequence is, that when an attempt is made to wash surfaces painted with such material, or even zinc prepared in a similar way, all will come away with the dirt; the oil also, if reduced by an extra dose of the sulphuric acid to as granular a state as the lead or zinc; but should the oil be perfect, then it alone is left to protect the work, but deprived of its uniform appearance.

Then, although it is notorious that all paint will blister if applied to new plaster or unseasoned wood, yet is it not probable that it may arise from the agency of water contained in the oil or pigment mixed with it? This appears to be more particularly the case when the work is made to dry rapidly by the addition of mineral driers—the surface of the paint gets dry and water-proof, preventing the escape of watery vapour. My only anxiety is to obtain an article to stand the test of time.

A MEMBER.

BROWN LIME.

Sir,—I am glad to see my views confirmed in regard to the finding of a boulder lime stone in the Principality fit for hydraulic works; but, in order to clear up all doubt, I should be much gratified if Mr. Girdwood would have the goodness to state, whether any manufacturing process be required in making up the Welsh hydraulic mortar, because, if so, the result will be nothing.

Should edge or face stones be required to grind the burnt limestone to powder, a large capital would be rendered necessary—the rock upon which we always split in England.

I allude to this point more particularly, because the hydraulic limestone of Italy is slacked and brought into fine dry powder by merely sprinkling the burnt limestone with the smallest possible quantity of water, while the mortar made from such lime requires to be inundated with water as fast as each course is laid.

I have also received a communication from Sir William Curtis, Bart., of Caynham-court, near Ludlow, informing me that the Poughnill limestone quarries on his estate will afford any quantity of hydraulic lime such as I have described.

In regard to the rottenstone mentioned by Mr. Girdwood, as being abundant in various parts of the Principality, I should wish he had found, instead, the real tripoli, that formerly came to us from the coast of Barbary, which is a much superior article, as it is of a very light buff colour, nearly white, and the grit is both finer and sharper.

Tripoli cannot be purchased at present in the ordinary way; the very dirty-looking rottenstone is always offered as a substitute; which may be, moreover, largely adulterated, while the true tripoli cannot, as it is imported in solid native lumps, and yet so soft that it requires no grinding.

HENRY W. REVELEY.

Parkstone, Dorset.

SNAKE BITES.

Sir,—Observing that some considerable attention has recently been directed by your Society to the subject of snake bites and their remedies, I would introduce to your notice that singular vegetable phenomenon the "snake nut" of Demerara, which is the product of a large tree, not by any means common in that country, where alone it is to be found.

The pericarp is hard, bivalvular, nearly round, and about an inch in diameter, and contains a soft, rather oily kernel, in the exact similitude of a coiled snake, tapering gradually to the tail, and possessing, when fresh, all the more prominent characteristics of the living reptile it represents, with distinctly formed eyes and mouth. There is also a soft pithy substance surrounding the kernel which is easily detached.

The native legend connected with this rather anomalous offspring of nature, is to the effect, that the kernels of these nuts are but the counterpart of a small and venomous species of snake, which frequents the roots of the tree producing them, but that the same kernels broken and applied to any wound caused by the bite of these reptiles, act as an antidote to the poison.

The description of the nut I have given from ocular observation of two or three which I possess, in a private collection of some 2,000 specimens of natural products, and the legend connected with it I had by word of mouth from a kind friend long resident in British Guiana, who furnished me with the nuts above mentioned.

The animal form assumed in this instance by a vegetable fruit is certainly deserving of the attention of naturalists and botanists, and appears to point to some such origin as that attributed by Dr. Hooker to the vegetable caterpillar of New Zealand, viz., the germination of a seed in the body of an animal which it must have destroyed, and whose form it consequently assumed.

These few imperfect remarks, if of no other service, may elicit further and more correct information from some of the readers of your Journal on so interesting a subject as the snake nut of Demerara.—I am, &c.,

T. D. ROCK.

8, Napier-terrace, Wellington-street, Islington.

POSTAL DISTRICTS.

SIR,—I would take the liberty of suggesting, as a means of more readily carrying out the recent postal arrangements, that the initials of each district should be painted on the wall under the name of the street. The majority of persons will not take the trouble of informing themselves of the district in which each street is situated if that information can only be derived from circulars or maps,—but they must acquaint themselves with the names of the streets in order to carry on their everyday transactions. If, then, the initials of the districts be placed under the name of the street, people will learn the street and the district at the same time. I should recommend the ordinary stencil plate letters cut out, with which and with the necessary pot of white or black paint and a brush, the gaslighters, when they go with ladders in a morning to clean their lamps, could, whether they were able to write or not, mark every street, at a very small cost.—I am, &c.,

R. TEMPLE.

Jan. 12, 1857.

FEMALE EDUCATION.

SIR,—The Mayor of York, in his address to the Mechanics' Institution of that city, in speaking of the education of girls, said, that not only the lower classes should be instructed in domestic duties, but also those of the middle ranks of life. Indeed, when it is considered that many men in all professions have but very limited means at the commencement of their career, it behoves their wives to accommodate themselves so as to make the scanty earnings of their partners go as far as possible in procuring comforts, consequently, then, their wives should themselves be sufficiently instructed to direct inferior servants in domestic employments. But acquaintance with such matters need not interfere with the attainment of accomplishments and the higher branches of education; indeed, the contrary has generally been found to be the case. A proof of this may be seen in the *Mechanics' Magazine*, No. 1513, August 7, 1852, which enters into many useful details.—I am, &c.,

M. S. BENTHAM.

26, Wilton-place.

Proceedings of Institutions.

BEAUMONT INSTITUTION.—On Monday evening, Mr. P. L. Simmonds delivered an excellent and instructive lecture "On the Progress of Science in the Nineteenth Century," in which he gave an interesting résumé of the most important modern inventions and discoveries, and the benefits they had conferred on arts, manufactures, and commerce, and in promoting civilization. The lecture was illustrated by a variety of specimens of improved mechanism, and examples of the cheapening and improvement of articles of common use. The lecture gave much satisfaction to a numerous and intelligent audience.

To Correspondents.

ERRATUM.—In last number of the *Journal*, p. 111, col. 1, line 34, for "mechanical," read "unmechanical."

MEETINGS FOR THE ENSUING WEEK.

MON. London Institution, 7. Dr. Tyndall, "On the Nature and Phenomena of Light."
Chemical, 8. Mr. J. B. Lawes and Dr. J. H. Gilbert, "On the Composition of Wheat Grain, and its Products at the Mill, with Observations on Bread."
TUES. Royal Institution, 3. Prof. Huxley "On the General Nature of Motion and Sensation in Living Bodies."
Civil Engineers, 8. Renewed Discussion on Mr. Window's paper "On Submarine Electric Telegraphs."
Linnæan, 8.
Pathological, 8.
Statistical, 8. Mr. W. G. Lumley, "An Account of a Banking Establishment at Belgium, entitled L'Union du Crédit de Bruxelles."
WED. Royal Soc. Lit., 4½.
Society of Arts, 8. Mr. E. G. Squier, "On the proposed Honduras Interoceanic Railway."
Geological, 8. Mr. Prestwich. "On a Fossilliferous Ironsand on the chalk escarpment of the North Downs," and other communications.
THURS. Royal Institution, 3. Prof. Tyndall "On Sound."
Royal Society Club, 6.
Numismatic, 7.
Antiquaries, 8.
Royal, 8½.
FRI. Royal Institution, 8½. Prof. Tyndall, "Observations on Glaciers."
SAT. London Institution, 3. Mr. T. A. Malone, "On Experimental Physics, chiefly in Relation to Chemistry."
Royal Institution, 3. Prof. Phillips "On the Nature and Origin of the Rocky Crust of the Globe."
Royal Botanic, 3¾.
Medical, 8.

PATENT LAW AMENDMENT ACT.

APPLICATIONS FOR PATENTS AND PROTECTION ALLOWED.

[*From Gazette, January 9th*, 1856.]

Dated 20th November, 1856.

2751. Richard Archibald Brooman, 166, Fleet-street—A method of, and certain varnishes or compositions for rendering wood and other substances uninflammable and fire-proof, applicable also to the indurating of calcareous earths and stone, and to the rendering of paper and fabrics damp-proof, together with apparatuses for manufacturing such compositions. (A communication.)

Dated 3rd December, 1856.

2866. Thomas Crabtree, Halifax, Yorkshire—Improvements in card-setting machines, and in certain machinery or apparatus employed in the construction thereof, which apparatus is also applicable to similar purposes.

Dated 17th December, 1856.

2985. John Smith, Heywood, Lancaster—Improvements in machinery for pumping.

Dated 18th December, 1856.

2995. Francis Barber Howell, 36, High Holborn—Improvements in machinery for cutting or making corks. (A communication.)
2997. William Hartley, Bradford, Yorkshire — Improvements in spinning frames for spinning wool, hair, alpaca, cotton, silk, flax, or any other fibrous substances, on spools, paper tubes, or any kind of bobbins.
2999. George Miller Clarke, Goldington, Herts—Improvements in the manufacture of moulded candles.
3001. William Knox Wigram, Lincoln's-inn — An apparatus for igniting lucifer matches, or matches tipped with phosphorous or igniting composition.
3003. Joho Brown, Liverpool—Improvements in the construction of ships' yards.
3005. Warren A. Simonds, Boston, Massachusetts, U.S. — An improved life-preserving float.

Dated 19th December, 1856.

3007. William Rye and James Simpson, Oldham, Lancashire—An improved self-acting willow for opening cotton and other fibrous materials.
3009. Charles Massi, 13, Greville-street, Hatton-garden—Improvements in apparatus for mounting cameras.

Dated 20th December, 1856.

3013. Henry Batchelor, Newport, Monmouthshire — Certain improvements in steam boilers.
3015. Thomas White, Sleaford, Lincolnshire—A new or improved manufacture of boots, shoes, and other coverings for the feet.
3019. Charles Cave Wilkinson, 14, Hermes-street, Pentonville—An improvement in carving forks.

Dated 22nd December, 1856.

3021. Robert Gibson, Hull, Yorkshire—An improved self-acting apparatus for signalling on railways.
3023. William James Payne, 119, Waterloo-road, Lambeth—Certain improvements in casting and finishing cocks for general purposes.

3025. Louis Antoine Lang, Rue de Chaillot, No. 64, Paris—A new system of rotary motion for all kinds of vehicles.
3026. Ebenezer Thornton, Huddersfield—Improvements in furnaces.
3028. Thomas Lyon Thurlow, Baynard's-park, Surrey—Improvements in reaping machines.
3029. William Henry Stratton, 179, Lambeth-walk, Lambeth—Improvements in the fire-doors of furnaces.
3030. James Redgate, Edwin Ellis, and John Cropper, Nottingham—Improvements in bobbin net or twist lace machinery.
3032. George Davis, Clerkenwell—An improved name and business plate for the outsides of doors and windows.
3033. Edward Stanford, Charing cross, Westminster—An improvement in the manufacture of envelopes.
3034. William Beckett Johnson, Altrincham, Cheshire—Improvements in steam engines and in apparatus connected therewith.
3035. William Smith, 10, Salisbury-street, Adelphi—Certain improvements in railway rolling stock. (A communication.)
3036. Frederic Prince, 4, Trafalgar-square—Improvements in firearms.

Dated 23rd December, 1856.

3037. Joseph Sharp Bailey, Keighley, Yorkshire—Improvements in machinery for combing wool and other fibrous materials.
3038. William Spence, 50, Chancery-lane—Improvements in the manufacture of felt. (A communication.)
3039. James Robertson Dick, Alnwick, Northumberlandshire—Improvements in window sashes.
3040. William Edward Newton, 66, Chancery-lane—An improved mode of manufacturing capsules for containing medicines. (A communication.)
3041. William Edward Newton, 66, Chancery-lane—Certain improvements in meters for water and other liquids. (A communication.)
3042. John Anderson, Woolwich—Improved means of protecting floating batteries, ships, land batteries, martello towers, or other constructions, against shot or shell, or other projectiles.
3043. William Farrer Ecroyd and Jonathan Heywood, Marsden, Lancashire, and George Scarr, Burnley, Lancashire—Improvements in looms for weaving.
3044. James Lark, 5, Bridge-foot, Vauxhall-cross—Improvements in kilns for burning materials in the manufacture of lime and cements.
3045. Julien Louis Guillaume Bailly, King-square, Middlesex—Improvements in winding up or maintaining the power of clocks.
3047. Felix Dehaynin, Paris—Improvements in machinery for moulding and pressing artificial fuel and plastic substances, and for driving the same from the moulds.
3048. George Washington Van Abbott, Croydon—An improvement in bank notes, which is also applicable to share certificates and other similar documents.
3049. Alfred Heather, Portsmouth—Improvements in ferry boats.

Dated 24th December, 1856.

3050. William MacNaught, Manchester—Certain improvements in steam engines.
3051. Benjamin Goodfellow, Hyde, Cheshire—Improvements in the construction of steam boilers.
3052. William Macpherson, Manchester—Certain improvements in machinery for spinning and doubling cotton and other fibrous materials.
3053. Giuseppe Antonio Giovanni Nani, Sablonière Hotel, Leicester-square—Improvements in toys for the use of children.
3054. William Taylor, Nottingham—Improvements in producing various ornamental effects upon fabrics, paper, and other surfaces.
3055. James Samson Barraclough, Halifax, Yorkshire—Improvements in the means, machinery, or apparatus used for grinding dye-wares.
3058. John Elliott, Sunderland—Improved machinery for manufacturing rivets, bolts, spikes, and other similar articles.

Dated 26th December, 1856.

3061. Jacques Hostein, ainé, Bordeaux, France—An improved mechanism for stopping railway trains.
3062. David Macdonald, Glasgow—Improvements in washing, bleaching, cleansing, and preparing textile fabrics and materials.
3063. William Smith, 85, Margaret-street, Cavendish-square, and Donald Bethune, Cambridge-terrace, Hyde-park—Consuming or preventing smoke in chimnies and furnaces.
3065. William Irlam, Gibraltar Iron Works, Newton Heath, Manchester—Improvements in the construction of railway turntables and weighing cranes.
3066. Sidney Newburgh, Islington, and Charles Steinhart, Great Aile street, London—Improvements in keys and certain means for preventing the picking of locks. (A communication.)
3067. Frederick Campin, 156, Strand—The manufacture of a certain textile fabric, which the inventor terms "tissu buffle."—(A communication.)
3068. John Clay, Birmingham—A new or improved portable printing or impressing instrument.
3069. John McIntyre, Newcastle-upon-Tyne—A safety-sounding apparatus or alarum for sailing ships and steam vessels.
3070. Henry Horace Goodman, 1, Rue Grange Bateliere, Paris—Improvements in the construction of locks. (A communication.)
3071. William Lawrence Mitchell, 34, Albert-terrace, London-road, Southwark—Improvements in railway switch and signal apparatus.
3072. George Heppell, Uttoxeter, Staffordshire—An improved method of producing signals in railway trains by means of air.
3073. William Clarke Deeley, 3, Devonshire-terrace, Westbourne-terrace, Hyde-park—Improvements in reducing copper ores. (A communication.)
3074. William Clark, 53, Chancery-lane—Improvements in air and waterproof coatings, and in their application. (A communication.)

Dated 27th December, 1856.

3075. Richard Reeves Cox, Fareham, Hants—Improvements in the manufacture of artificial fuel, and in machinery for that purpose.
3077. William Edward Newton, 66, Chancery-lane—Improvements in sewing machines. (A communication.)
3078. Thomas Shaw, Ilkeston, Derbyshire—Improvements in furnaces or fireplaces.
3079. James Petrie and William Mc Naught, Rochdale—Improvements in steam-engines.
3080. Thomas Wilks Lord, Leeds—An improved mode of drying flax, tow, hemp, silk, cotton, and other yarn, in the process of dressing, warping, sizeing, beaming, and preparing yarn for weaving.
3081. William Swain, Birmingham—Improvements in heating and ventilating.
3082. George Ritchie, Ponsonby-street, Middlesex—Improvements in the manufacture of beds and mattresses.
3083. John Cheesman Wagstaff, Cannon-street, London—Improvements in the manufacture of felted cloth. (Partly a communication.)
3084. Isaac Atkin and Marmaduke Miller, Nottingham—Improvements in folding lace, paper, and other fabrics.
3085. Joseph Morel, Gap, France—Improvements in castors for fitting under the feet of tables, seats, and other similar pieces of household goods.

Dated 29th December, 1856.

3087. Horace Vaughn, Providence, Rhode Island, U.S.—An improved method of hardening and tempering steel, and of hardening cast and wrought iron.
3088. Joseph Henry George Wells, 45, Essex-street, Strand—Improvements in pumps and valves used therewith. (A communication.)
3089. Timothy Alden, New York, U.S.—Setting and distributing printing types.
3090. John James Speed, jun., and John Aylesworth Bailey, New York, U.S.—Improvements in the manufacture of seamless pipes and tubes.

Dated 30th December, 1856.

3092. Jean Louis Celestin Le François de Grainville, 39, Rue de l'Echiquier, Paris—Certain improvements in heating apparatus.
3094. Richard Archibald Brooman, 166, Fleet-street—Improvements in the construction of portable houses and other buildings. (A communication.)
3096. Richard Archibald Brooman, 166, Fleet-street—An improvement in sawing machinery. (A communication.)
3098. George Alfred Shaw, Dartmouth-row, Blackheath—An improved machine for thrashing and cleansing corn or grain. (A communication.)

Dated 31st December, 1856.

3100. Jean Omer Henry, 39, Rue de l'Echiquier, Paris—Certain improvements in the production of embossed surfaces on wood.
3102. William Bray, Folkstone—Improvements in traction engines.
3104. Alexander Robert Terry, 45, Bedford-row—Improvements in machinery for cutting sugar and other substances.
3106. William Charles Mann and Frederick John Ingram, East Parade, Leeds—An improved mode of embossing cloth or other fabrics.

WEEKLY LIST OF PATENTS SEALED.

January 9th.

1626. Moss Defries.
1631. John Marsh and John Catt.
1633. Samuel Hardacre.
1639. John Westwood.
1643. Edward Henry Cradock Monckton.
1646. Thomas Madely Hartwell, James William Gladwin, and Henry Gladwin.
1657. William Williams.
1697. John Hamilton.
2165. George Tomlinson Bousfield.
2293. John Dauglish.
2359. Peter Ward.
2365. James Atkinson Longridge and Thomas Richardson.
2376. William Johnson.
2463. William Clay and Josiah Harris.
2493. John Dearman Dunnicliff and Walter Dexter.
2595. William Edward Wiley.
2597. James Fernihough and Robert Farrow.
2664. William Henry Balmain and Thomas Colby.

Patents on which the Third Year's Stamp Duty has been Paid.

January 5th.

224. Benjamin O'Neale Stratford.
962. Andrew White Gibson.

January 6th.

47. Richard Albert Tilghman.
70. Marcel Vetillart.
101. George Fergusson Wilson.
102. George Fergusson Wilson.

January 7th.

39. Anthony Bernhard Baron Von Rathen.
48. Richard Husband.

January 8th.

45. Benjamin Burleigh.

January 9th.

56. Rev. William Renwick Bowditch.
60. Adolphe Drevelle.
67. Felix Lieven Bauwens.
109. Henry Holland.
212. Josiah Latimer Clark.
325. Benjamin Hornbuckle Hine, Anthony John Mundella, and Luke Barton.
365. Benjamin Hornbuckle Hine, Anthony John Mundella, and William Onion.

Journal of the Society of Arts.

FRIDAY, JANUARY 23, 1857.

CONVERSAZIONI.

The Council have arranged for two Conversazioni for the Members of the Society and their friends, the first to take place on Saturday, the 21st of February, to which ladies will be invited; the second on Wednesday, the 6th of May, to which gentlemen only will be invited.

NINTH ANNUAL EXHIBITION OF INVENTIONS.

The Council have fixed Monday, the 23rd of March next, for the opening of the Ninth Annual Exhibition of Recent Inventions.

Persons intending to contribute to the Exhibition should communicate with the Secretary forthwith, stating—

1. The title of the invention.
2. Whether the article will be a specimen, model, or drawing.

Articles for exhibition must be forwarded to the House of the Society, *carriage paid.* The days for receiving articles are, Thursday, the 5th, Friday, the 6th, and Saturday, the 7th of March.

All articles should be accompanied with a short description of the invention, for the Catalogue, with a wood-block (when possible), and a reference to any publication where a fuller account may be found.

HONORARY LOCAL SECRETARY.

The following gentleman has been appointed Honorary Local Secretary for Bedford:—

Dr. Herbert Barker.

COUNCIL.

Notice has been given that the following Resolutions will be submitted for the *consideration* of the Council, on the 4th of February next, and it has been ordered that the Council be specially summoned for that day, at 6 p.m.

"The Council are of opinion that the time has arrived when, in order to give just facilities, throughout the United Kingdom, for acquiring knowledge in Art and Science, it is expedient that the National Museums situate in the metropolis and elsewhere, such as the National Gallery, the British Museum, the Museum of Ornamental Art, the Museum of Practical Geology, and the public Museums in Ireland and Scotland, &c., which have already acquired, or may hereafter acquire, by Parliamentary votes, specimens of Art and Science, should be rendered, as far as may be practicable, useful to, and brought into connexion with, the Local Institutions promoting Art and Science throughout the United Kingdom, especially the Mechanics' and Literary Institutions in Union with the Society.

"For the purpose of discussing and organising the measures by which this resolution may be carried into effect, the Council propose to hold, on certain fixed days, a series of Extraordinary Meetings, during the ensuing Parliamentary Session, to which they will invite the Members representing the Institutions in Union with the Society.

EDUCATIONAL MUSEUM,

Under the Charge of the Lords of the Committee of Privy Council on Education, Cromwell-road, South Kensington.

1. To aid all classes of the public in carrying out the work of National Education, and especially those engaged in teaching, the Lords of the Committee on Education have arranged to establish at the new buildings at South Kensington, a museum, which will exhibit under a proper classification all important books, diagrams, illustrations and apparatus connected with education, already in use or which may be published from time to time, either at home or abroad.

2. It is proposed that the museum shall be opened to the public next spring. The public will be admitted free to the museum as a public exhibition on certain days of the week; and on other days, which will be reserved for students, opportunity will be given to examine and consult the objects.

3. The objects exhibited at St. Martin's-hall in 1854, which were presented to the Society of Arts, and by that Society given to the Education Board, in order to found a museum, will form part of the Educational Museum. The producers of apparatus, books, diagrams, maps, &c., used in teaching will have the privilege—subject to certain regulations—of placing their publications and productions in the museum, and thus making them known to the public. A catalogue will be prepared which will contain the price lists which exhibitors may furnish for insertion.

4. The books and objects will be grouped under the following divisions:—1. School buildings and fittings, forms, desks, slates, plans, models, &c. 2. General education, including *a*, Reading; *b*, Writing; *c*, Grammar; *d*, Arithmetic; *e*, Mathematics; *f*, Foreign Languages; *g*, Histories. 3. Drawing and the Fine Arts; 4. Music; 5. Household Economy; 6. Geography and Astronomy; 7. Natural History; 8. Chemistry; 9. Physics; 10. Mechanics; 11. Apparatus for Teaching the Blind and the Deaf and Dumb.

5. In organising the museum, the Committee on Education hope to have the co-operation of all who are interested in the object.

Books, diagrams, maps, apparatus, &c., intended for the museum, may be addressed to the Secretary of the Department of Science and Art, Cromwell-road, South Kensington, care of Mr. Richard Thompson, Superintendant of the museum.

Jan. 1857.

SEVENTH ORDINARY MEETING.

Wednesday, Jan. 21, 1857.

The Seventh Ordinary Meeting of the One Hundred and Third Session was held on Wednesday, the 21st inst., T. M. Weguelin, Esq., Governor of the Bank of England, in the chair.

The following Candidates were balloted for, and duly elected members of the Society:—

Arbuthnot, C. T.
Auchmuty-Glover, Edwd.
Coode, John.
Graham, Thomas, D.C.L., F.R.S.
Pearce, Dr. Ebenezer John.
Ranking, George Edgar.
Rawson, W. R., jun.
Thomas, James.
Trehonnais, Frederick Robieu de la.
Wrigley, Rev. Alfred.

The following Institutions have been taken into Union since the last announcement:—

430. Weymouth, Literary and Scientific Institution.
431. Dundee, Watt Institution.

The following School has been taken into Union since the last announcement:—

Holland House (Blackheath) School.

The Paper read was:—

ON CENTRAL AMERICA, AND THE PROPOSED HONDURAS INTER-OCEANIC RAILWAY.

By E. G. Squier.

I wish to call your attention this evening to a portion of the American continent which has lately attracted no small share of public notice, and which, from its geographical position, has a commercial and political importance second probably to no equal portion of the earth's surface. "If," asks M. Michel Chevalier, "setting aside, for a moment, the relative position of the leading nations of the present time, we stand before a chart of the earth, and, considering civilisation as yet to begin, inquire of ourselves where we ought to place the capital of the world—the city in which the Amphictyons of a universal confederacy should meet in council—what spot would suggest itself as presenting the highest claims to the general suffrage?" Perhaps no one acquainted with my antecedents, and the somewhat special nature of my studies, would be surprised if I were to put in no timid plea in behalf of Central America, as best fitted, in respect of geographical position, in the extent, value, and variety of its natural resources, and best entitled, in respect of the magnificence of its scenery and the beauty of its skies, to be the chosen spot whence the navies of the world should radiate, and where the city of universal brotherhood should be founded.

Certainly, in respect of geographical position, it almost realises the ancient idea of the centre of the world. Not only does it connect the two grand divisions of the American continent, the northern with the southern hemispheres, but its ports open to Europe and Africa on the east, and to Polynesia, Asia, and Australia on the west. Here, too, the continent shrinks to its narrowest limits; and, standing upon some high peak of the Cordilleras, the adventurous traveller, with the sky of eternal summer above, and the exuberance of an unfading, tropical vegetation around him, may look down upon the restless Atlantic—the great highway of commerce—on one hand, and upon the broad Pacific, rolling its unbroken waves over half the globe, on the other.

Glancing at the map, we find, at the isthmus of Tehuantepec, on the north-west, the Gulf of Mexico approaching to within 200 miles of the Pacific Ocean, the waters of the river Coatzacoalcos, which flows into the former, almost interlocking with those of the Chicapa, flowing into the latter. Below this point the continent widens, embracing the high table-lands of Guatemala on the west, and the broad plains of Tobasco, Chiapas, and Yucatan upon the north and east. The Bay of Honduras, however, closes around this section on the south-east, and again narrows the continent within 160 miles. The country intervening between this bay and the Pacific, comprised within the State or Republic of Honduras, is traversed by a grand transverse valley, running due north and south, through which the large river Ulua finds its way into the Atlantic, and the smaller river Goascoran flows into the Bay of Fonseca, on the Pacific. It is precisely this great physical feature which affords the means of here constructing a railway, extending from sea to sea, to the advantages and value of which I shall soon beg to call your attention.

Passing this point, which I shall distinguish as the Isthmus of Honduras, still lower down, we reach the great transverse basin of the Nicaraguan lakes, supposed to constitute one of the best lines on which to construct an inter-oceanic canal, and to which, also, I shall have occasion again to refer. Below the Nicaraguan basin, we find the well-known narrow Isthmus of Panama or Darien, over which the tide of emigration has twice poured its floods—once upon Peru, and again upon the glittering shores of California.

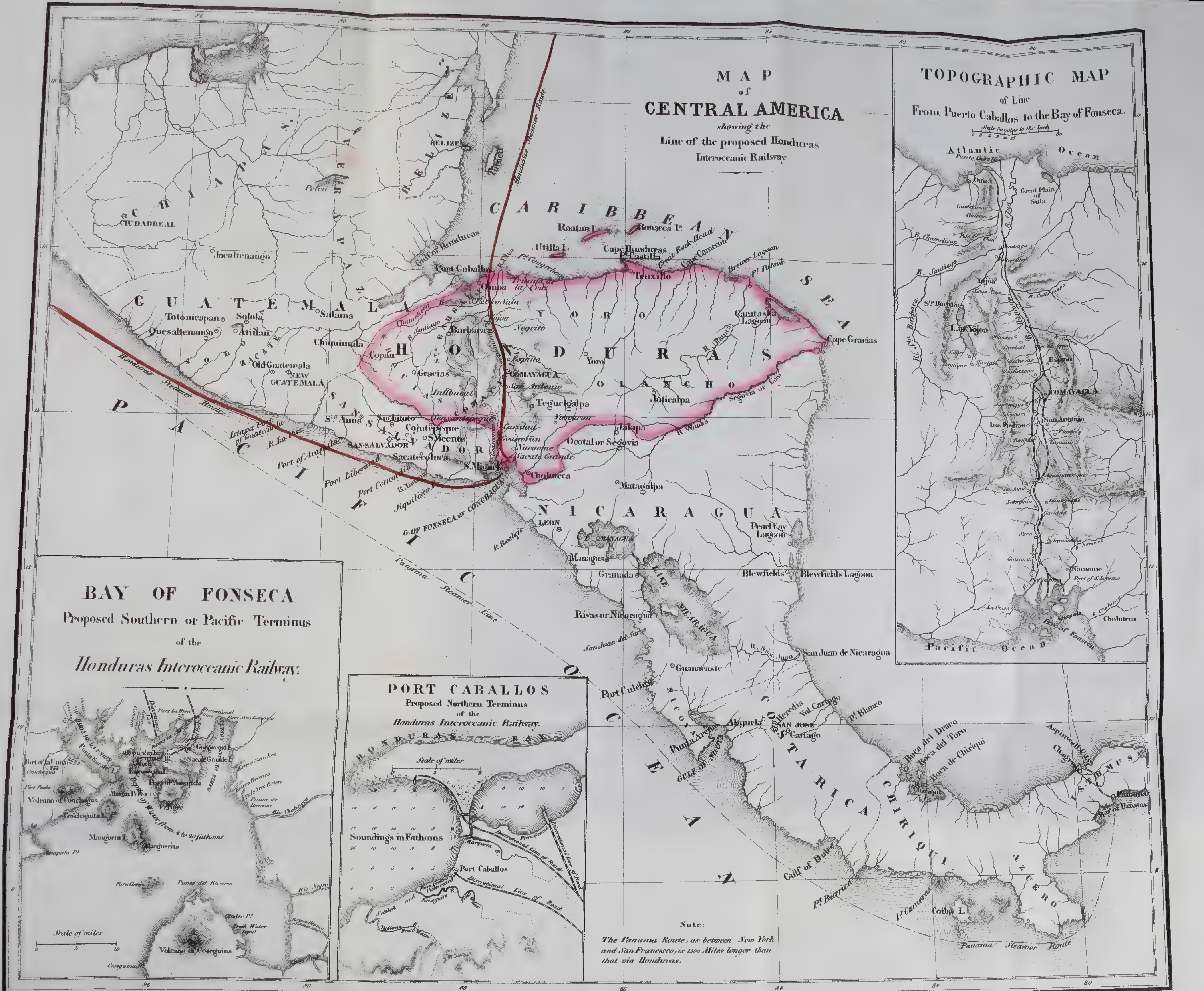
The points which I have indicated, where the continent is most contracted in width, it is also worthy of remark, are coincident with those where the great mountain chain of the Cordilleras—the back-bone of the continent—is either greatly depressed, or entirely interrupted; thus affording greater or less facilities for those ways of communication between the oceans, which have become among the desiderata of modern times.

Nor are the topographical characteristics of Central America less remarkable than its geographical features. In its physical aspect and configuration of surface, it is an epitome of all other countries and climates of the globe. High mountain ranges, isolated volcanic peaks, elevated table-lands, deep valleys, broad and fertile plains, and extensive alluvions, are here found grouped together, relieved by large and beautiful lakes and majestic rivers, the whole teeming with animal and vegetable life, and possessing every variety of climate, from torrid heats to the cool and bracing temperature of eternal spring.

But time would fail me in attempting to indicate to you the physical peculiarities of the country as connected with its climate, and as influencing the variety and value of its productions, and the probable future character of its population. I hasten, therefore, to the consideration of the question of interoceanic communications through Central America, as being that which gives to this portion of the continent its present principal importance in the eyes of the commercial and maritime nations of the world, and to which its latent elements of greatness are regarded only as secondary.

From the period of the discovery of America in the 15th century, when Balboa crossing its narrowest isthmus at Darien, rushed, buckler and sword in hand, into the waters of the South Sea, and claimed its almost limitless shores for the crown of Castile and Leon, to the present hour, that country has been regarded with a constantly increasing interest, which the requirements of commerce, the recent acquisitions of the United States in the Pacific, and the discovery of gold in California and Australia, have not only augmented, but turned to a practical direction.

Columbus, not yet comprehending the importance of his own discoveries, coasted along its eastern shores from Honduras, where he first planted his foot on the continent, as far southward as the mouth of the Orinoco, in anxious hope and impatient endeavour to discover a passage through which the treasures of the East might be poured into the lap of Spain. The same rich prize, augmented in value by the lapse of time and the progress of discovery, is still offered to the enterprise of the world. Asia, with its vast populations and increasing wants, furnishes a market worthy of the competition of nations. New and growing states have sprung into a vigorous existence on the Pacific Coast of America, which are destined, in the course of time, to reach a pitch of greatness equalling that of the proudest nations



MAP
of
CENTRAL AMERICA
showing the
Line of the proposed Honduras
Interoceanic Railway

TOPOGRAPHIC MAP
of Line
From Puerto Caballos to the Bay of Fonseca.

BAY OF FONSECA
Proposed Southern or Pacific Terminus
of the
Honduras Interoceanic Railway.

PORT CABALLOS
Proposed Northern Terminus
of the
Honduras Interoceanic Railway.

Note:
The Panama Route, as between New York and San Francisco, is 1300 Miles longer than that via Honduras.

Gravée chez Erhard Schièblé r. Bonaparte 42, Paris.

Imp. chez Hangard Mongé rue Honoré Chevalier.

of Europe. The Australian and Polynesian Islands have already risen into importance, and now enter largely into the commercial and political calculations of the maritime world. A new empire is planting deep its foundations on the coast of New Holland, and it requires no great degree of prescience to predict that, sooner or later, it must take high rank among independent nations. In short, the great tides of civilisation, for three centuries moving majestically eastward to India, and westward to the New World, now meet in the waters of the Pacific; they have encircled the globe, and the "short and easy passage to the Indies," which Columbus and Cortez, and Cabot and Vespucius, and Raleigh and Verrazzano, sought in vain, from Hudson's river southward to Cape Horn, and northward to the yet impenetrable fields of Arctic ice, from a leading desideratum has become the great necessity of the age.

Deeply impressed with the importance of such a communication, the great Charles, writing from Valladolid in 1523, enjoined upon Cortez to seek diligently for "*el secreto del estrecho*," the secret of the strait which would shorten, as was then supposed, by two-thirds, the voyage from Cadiz to the "land of spices," and the shores of Cathay. In reply to this behest, the Mexican conqueror laments the failure of his search, but consoles himself with the hope that he will yet be able to achieve that grand discovery, which, he adds, "would make the King of Spain master of so many kingdoms that he might consider himself lord of the world."

Geographical research, however, early demonstrated that to this "short and easy passage" the American continent presents an unbroken barrier. From that period the daring of man began to contemplate the Titanic enterprise of cutting through the continent, and opening an artificial water communication between the two oceans.

The kings of Spain, ruling over dominions equalling in extent the proudest empires of antiquity, and supported by a people roused to the highest pitch of daring and of enterprise, looked with impatience upon the barrier which interposed between their ambitions and those oriental kingdoms which their fancies had surrounded with exaggerated splendours and invested with unbounded wealth. To overcome this obstacle became at once a leading object of imperial zeal. The bravest and best of their subjects, knowing well the rich rewards which success in this respect would be sure to secure, devoted to it all the intelligence and energy of the period. They traversed the continent and investigated its recesses, as eagerly and as thoroughly as their predecessors on the sea had scrutinised every river, and inlet, and bay, in their unavailing search for the "short and easy passage to the Indies." Could we expose to light the treasures of the Spanish archives, that mine of early American history, we would find abundant evidences that not a single point which modern research has indicated as affording facilities for inter-oceanic communications, had escaped the observation of these active and indefatigable explorers. Certain it is, that within thirty years after the discovery, all the great lines of transit which are now known and recognised, had been very carefully traced, and their capabilities very accurately pointed out.

"It is true," wrote the ancient historian Gomara, "that mountains obstruct these passages, but if there be mountains there be also hands; let but the resolve be formed to make the passage, and it can be made. If inclination be not wanting, there will be no want of means; the Indies to which the passage is to be made will itself supply them. To a King of Spain, with the wealth of the Indies at his command, when the object to be attained is the spice trade, that which is possible is easy."

But at that early period engineering science, except perhaps in its application to military purposes, was in its infancy, and under the system and with the comparatively limited mechanical appliances of the day, the task of cutting through the continent was too vast for even the gigantic power of Spain, with the spoils of a hundred conquered nations at its feet, to undertake. The swart miners of England had not yet torn up the iron ribs of the earth, wherewith to fashion implements for the hands of the, as yet, untamed spirit of fire and water, the giant steam—beneath whose mighty blows the hills crumble down, and who now pauses with uplifted weapon, more potent than the thunder mallet of the Scandinavian Thor, before the very Alps themselves, threatening to smite through that massive barrier, to scale which constituted the fame of a Hannibal, and was the boast of a Napoleon! The Kings of Spain had the will to do, but lacked the ability to accomplish. Slowly and reluctantly they were compelled to abandon their cherished scheme of a great open cut channel for their fleets into the South Sea, and to accept the only alternative of a long, circuitous, and dangerous voyage by the Straits of Magellan.

For all purposes of rapid communication, nevertheless, the monarchs of Spain depended upon those roads across the continent which their inability to convert into canals had compelled them to accept. The galleons from the Philippines, and those laden with the treasures of Peru, and carrying also the passengers and correspondence of that period, concentrated either at Panama or Acapulco, whence their precious freights were transferred overland to the Atlantic coast, and thence despatched to Spain.

The selection of these points of communication between the seas was not, however, made with reference to those conditions which would govern a choice at the present time, and under our application of steam to sea and land transport. Depending necessarily upon mules as a means of conveyance, the Spaniards fixed upon those points where the continent was the narrowest, and with little reference to such consideration as good ports and salubrious climate, which would now be regarded as of more consequence than distance, since, in the aggregate of a voyage, it is of little importance if the transit be effected in two hours or six.

But the adoption both of Acapulco and Panama was perhaps, chiefly determined by accidental circumstances. The discovery of Peru, the achievements of Pizarro and his captains, and the spoils which they wrested from the Incas, immediately directed thither the current of adventure. This current swept naturally over the Isthmus of Panama, and contributed, equally with the considerations that I have already mentioned, to fix the principal line of communication between the seas at that point, where also trading and other establishments and interests gradually grew up, hostile to any change, however powerful the considerations on which it might be demanded.

Yet the extreme insalubrity of the Isthmus of Panama, its inability to furnish supplies, and its deficiency in good ports, stimulated the Spanish Crown, and particularly the famous "Council of the Indies," to encourage the opening of a better and more salubrious route of transit.

The search for a point which would admit of the construction of a canal, to which I have alluded as having been prosecuted with the greatest zeal and energy, had resulted in the discovery of a line in the then province, now state of Honduras, which it was supposed offered certain facilities for that project. But when the plan of a canal was laid aside, and the purposes of the crown, for the time being, limited to the choice of a route overland, which should meet the immediate requirements of the nation and its colonies in the Pacific, attention was again directed to the line across Honduras.

Historical Notices.

As early as 1540, but 38 years after Columbus had landed on the shores of Honduras at Truxillo, and but 14 years after Cortez himself, at the close of a long and weary journey from Mexico overland, had built the town of Natividad, at Puerto Caballos—as early as 1540, Alonzo Casceres, one of the lieutenants of Alvarado, had founded the city of Comayagua, then called Valladolid, the present capital of Honduras, in obedience to instructions, "*to find out an eligible situation for a town, midway between the oceans.* It was the intention of the founders," adds the historian of Guatemala. Juarros, "by means of this place to obtain *an easy communication between the Atlantic and Pacific;* its situation, being about half-way between Puerto Caballos and the Bay of Fonseca, would render it a convenient intermediate depot; the climate being healthy, and the soil fertile, much of the sickness and waste of human life would be prevented, and many of the fatigues and privations avoided, that were usually experienced in the journey from Nombre de Dios [Chagres] to Panama."

Although the establishment of the City of Comayagua does not seem to have led to any immediate change in the course of trade across the Isthmus of Panama, still the object had in view was neither neglected nor abandoned. Amongst the many papers relating to this subject in the Department of the Marine, at Madrid, is a memorial addressed to the King of Spain, in 1565, by Philip de Aninon, entitled; "*On the utility and advantages which would result from changing the route of transit between the seas, from Nombre de Dios and Panama to Puerto de Caballos and Fonseca.*" From this MS. it appears, that in the year 1554, the King of Spain commissioned Juan Garcia de Hermosilla to make a special examination of the route through Honduras, and of the ports at its extremities. The observations of Hermosilla were embodied in two memorials, presented by him to the King, in Valladolid, dated 1556, and in a report of the examination of a number of witnesses to the facts therein presented, made at Seville, in 1558. Amongst those who testified on that occasion, and supported the recommendation of Hermosilla in favour of the change, we find the names of the celebrated chronicler of the Indies, Gonzalez Hernandez de Oviedo, of Juan de Barbosa (Governor of Tierra-firme), and the cosmographer Luis Gutierrez.

The memorial of Aninon sets forth, that the subject of which he proposes to speak is one that "concerns the glory of God, the service of his Majesty, and the common good," and he claims to be heard, and have his representations credited, as "being an old settler in the country, well informed on its condition and resources, and from having travelled all over it." He affirms that the change proposed by Hermosilla would "result in the saving of the lives of many Spaniards, in consequence of a better climate; in the better protection, at less cost, of the establishments on both seas, against the attacks of freebooters and pirates, and in the speedy establishment of ten or twelve cities, in a country rich in the ores of gold and silver, and abounding in corn, cattle, and other supplies."

Upon the point of comparative salubrity, Aninon speaks with the blunt emphasis of a man in downright earnest. He says:—"At the outset, if there be anything on earth which may be compared to hell, it is the climate of Nombre de Dios, which is so notorious that I shall not enlarge upon it, but sum up by saying, that in all the Indies, fruitful and abundant as they are, Nombre de Dios alone is so thoroughly barren, that no kind of fruit can be grown there, not even plantains; nor can children be reared there; and the Spaniards die out so rapidly, that the population becomes almost entirely extinct every six months, and is only filled up by the number of persons attracted thither by the large profits on the vast quantities of gold and silver which pass through the place."

He next combats the objection that, if abandoned by the Spaniards, the Isthmus of Panama would be occupied by the French. This notion he pronounces "ridiculous, since even the Spaniards themselves, a people more hardy and temperate than the French, cannot withstand the violence of the climate, which would soon break up the French settlements, if any were attempted." And in reply to the objection that the change would destroy the establishments at Nombre de Dios and Panama, he asks if it be the part of a wise monarch, or a rational people, to persist in a fatal error, because its correction may involve a temporary sacrifice, which, after all, would be only apparent, since the advantages resulting from the change would speedily compensate the loss. "Why," he exclaims, "a dozen new cities might be founded in Honduras, with the people who perish in the fleets at Nombre de Dios and Panama, amounting annually to 1,500 men! This mortality," he adds, "would be entirely prevented at Puerto de Caballos, for, although all the ports in the North Sea are sickly, but in no comparison with Nombre de Dios, yet it must be remembered that here, at a distance of four, six, and ten leagues inland, the country is salubrious, which is not the case on the Isthmus of Panama."

In evidence of the fruitfulness of Honduras, and the advantages which it offered for the transit, he affirms that, at the early day when he wrote, "it abounded in supplies of wheat, maize, cattle, sheep, goats, mules, horses, and poultry, both Spanish and native;" and that, while the cost of transporting a mule cargo across the Isthmus of Panama, a distance of eighteen leagues, was thirty silver dollars, "it might be carried across Honduras, a distance of fifty leagues, for nine dollars; which circumstance," he adds, "shows the sterility of one country and the fruitfulness of the other." He alludes, also, to the numerous mines of gold and silver in Honduras which would be brought into notice by the proposed change in the transit, and which would contribute largely to the revenues of the crown. "Thus the change," he continues, "would here create for his majesty a kingdom richer than Spain itself, and, should any wars arise, it would serve to protect all the Indies, as it commands both New Spain (Mexico) and Peru, and hence was early called the 'Kingdom of the Confines.'"

Finally, Aninon points out, in a clear and practical manner, the steps necessary to effect successfully the proposed change, and concludes by begging the king not to be surprised that so humble an individual "should venture to present a memorial on a subject of so much importance and gravity. But," he adds, "as, at the commencement, the Gospel was preached by twelve simple-minded men, I may be allowed some liberty in speaking of this matter, from being a disinterested party and from having resided thirty years in the Indies." And, in order to avoid the imputation of interest which might attach to his advocacy of the change, he takes pains to say, "Now, I have solicited no place in this enterprise, nor would I accept one were it offered to me; hence it may be believed that a Christian mind, zealous for the service of God and his Majesty, has moved me to present this memorial."

Shortly after the presentation of the memorial of Aninon, namely, in 1578, another was laid before the King of Spain, by the Licenciado Diego Garcia de Palacios, Councillor of the Court, and Auditor of the Kingdom of Guatemala, entitled; "*On the Conquest and Pacification of the Phillippine Islands, and the advantages which would result if the communication with them were conducted across Honduras, and from the Bay of Fonseca, on the account of the greater convenience thereby afforded, as well for the outfit of his Majesty's fleets, as for the easier provisioning and greater comfort of those embarked therein.*" I do not propose to follow Palacios through his arguments in favour of the change, but shall confine myself to the quotation of a single paragraph.

After enumerating the difficulties and dangers of the transit through Mexico and across Panama, he says:—"To avoid these, your Majesty's troops and munitions for the Phillippines might pass across this province, disembarking at Puerto de Caballos, which is on the North Sea, and re-embarking at the port of Fonseca, which is on the South Sea. And, although the passage at Panama is shorter, yet the difficulties already recited, and others of a substantial nature, lie against it; while here there is greater salubrity, less opportunities for the desertion of soldiers, a larger supply of provisions, and greater facilities for building ships, at less cost, besides other things necessary and indispensable for the voyage and its comfort."

These representations, not less than the obvious necessities of a change, although contested by an opposing interest, nevertheless, induced the Council of the Indies to order a new and more complete examination of the Honduras line. Accordingly, in the year 1586, the celebrated Italian, Bautista Antonelli, universally conceded to have been the first engineer of his day, if not of that century, the builder of the Moro, at Havana, and of the first fortress of San Juan de Ulua, at Vera Cruz, was sent to America to make a survey of the route in question. This he effected in conjunction with one Juan Texada, and their joint report was made from Havana in 1591, and still exists amongst the archives of the Indies, at Seville. I have not yet been able to obtain a copy, and I am, consequently, unable to present his conclusions. That they were favourable to the proposed change, nevertheless, appears from the fact that the report called out a number of replies from the opposing interest. One of these, written in 1605, by the Dr. Alonzo de Castilla, makes the objection that the ports of Caballos and Fonseca, so far from being recommendable on the ground of their ease of entry and exit, as set forth by Antonelli, are for that reason to be avoided, since, he argues, "the rascally French and English pirates can enter and escape with ease, whereas, if the channels were narrow, intricate, and difficult, they could not enter without the aid of expert pilots, which they would be unable to obtain!" This is certainly an objection which, at this day, would hardly tell in favour of Dr. Castilla's case, or against the ports which he condemns!

I do not, however, propose to detain you any longer with what may be called the antiquarian part of my subject. The wars in which Spain became involved in the early part of the 16th century, and the large interests concentrated at Panama, which were naturally hostile to a change, were probably amongst the causes that suspended the opening of the transit across Honduras; and in the subsequent troubles of the mother country, extending equally to the colonies, which were harrassed by invasions, and their coasts infested by pirates of every nation, it would seem that the project was not only neglected but absolutely forgotten. It is said that sometime during the last century the line was again examined by engineers with reference to a canal, but of this fact I have been unable to obtain any satisfactory evidence. And here I may say that the notices which I have presented of the early attention given to the line in question, have all been obtained since I was first led, by observations on the spot, to suspect the existence of a favourable route of inter-oceanic communication through the republic of Honduras.

Proposed Railway.

In the year 1850, while occupying the position of diplomatic representative of the United States in Central America, it became requisite for me to visit the Bay of Fonseca, which has a commanding geographical position between the states of Nicaragua and San Salvador, on the Pacific Ocean. During my residence there, my attention was arrested by the circumstance that portions of this bay were swept by strong winds from the north, leading me to infer that there must exist an interruption in the great mountain chain of the Cordilleras, which otherwise would interpose an impassable barrier to the winds blowing from that direction. This inference was strengthened, on learning that the north winds prevailed only during the period of their continuance on the Atlantic coast, and was confirmed by the additional circumstance, that the current of wind reaching the Pacific was only felt over a very narrow space, not exceeding ten miles in breadth. It was with no surprise, therefore, on ascending the volcano of Conchagua, which rises above the port of La Union, that I turned my glass to the northward, and saw that the mountains of Honduras seemed to be completely interrupted in that direction.

Then, this fact only interested me as a remarkable feature in the general physical character of the country, nor was it until the autumn of 1852 that I was led to reflect upon it in connection with the subject of inter-oceanic communications. At this time the practical examination of the Isthmus of Tehuantepec, with reference to the construction of a railway between the seas, had resulted in establishing the fact of the total absence of adequate ports for the purpose upon both oceans. The project of a communication at that point had, moreover, become involved, politically, to such a degree, that little hope could be entertained of its successful prosecution until a new and permanent order of things should be established in Mexico; a result which the previous history of that country gave no warrant for anticipating as likely to happen for many years.

It was now rendered evident, that unless some better and more feasible route were discovered in order to reach California, it would continue to be necessary to follow the tedious, circuitous, and insalubrious route by way of the Isthmus of Panama.

The observations which I had made at the Bay of Fonseca now recurred to me with increased force, and induced me to inquire if there might not be a feasible railway route across the continent, terminating on that bay, in reference to which, and on other grounds, I had ventured the prediction, that, "from its position and capacity, it must ultimately become the great emporium of trade and the centre of enterprise upon that side of the continent."

On presenting my views upon the subject to a few personal friends and public spirited gentlemen, it was determined to incur the expense of verifying them by a direct and careful examination of the country in question. The expedition sailed from the United States in the month of February, 1853, and in the month of April following, commenced its operations in the field, taking the Bay of Fonseca as its point of departure. The accuracy of my previous inferences was speedily and fully verified. A line of observations and barometrical admeasurements was carried completely across the continent by Lieutenant Jeffers. A similar line was carried from Leon de Nicaragua to the city of Comayagua, in Honduras, by Dr. Woodhouse; and another, by myself, from Comayagua to the town of Santa Rosa, in the extreme western border of Honduras, thence to the city of San Salvador, in the state of the same name, and afterwards throughout the length of that state, from Sonsonate to the port of La Union, our point of departure.

But before proceeding to a special notice of the line in question, it will be useful to refer incidentally to some of the peculiar physical features of Honduras.

As I have said, its general aspect is mountainous; that is to say, it is traversed in various directions by ranges of mountains and hills, radiating from the common base of the Cordilleras. This great chain does not, however, approach within fifty or sixty miles of the Pacific, nor does it throughout maintain its general character of an unbroken range; but, in its course, sometimes turns back on itself, forming interior basins of varying elevations, not inaptly called by the Spaniards, *bolsones* or pockets.

The general course of the Cordillera, nevertheless, is east by south; but, after passing the *bolson*, or plain of Otoro, it abruptly turns due north, forming what is called the Montecillos, and finally loses itself in diverging ranges and groups of hills around the lake of Taulebé. At the eastern base of the Montecillos range, where the break in the Cordilleras is complete, lies the plain of Comayagua, which may be regarded as the most remarkable topographical feature of the state, considered with reference to the facilities which it affords for the grand economic purpose of travel and commerce between the seas. It occupies the geographical centre of the state, having its longest axis at right angles to that of the continent. From it, extending due north to the Atlantic Ocean, is the Valley of Humuya, and from it also, extending due south to the Pacific, is the Valley of the Rio Goascoran, altogether constituting a great transverse valley, reaching from sea to sea. These two rivers may be said to rise in the same plain, for they both have their sources side by side, in the slight dividing ridge or swell of land which defines its southern extremity. As I have already said, it is precisely this plain and its dependent valley, constituting a natural cut through the Cordilleras, which afford the avenue necessary for the construction of the proposed Honduras Inter-oceanic Railway.

The line of the proposed work commences at Puerto Caballos, on the Bay of Honduras, in lat. 15° 49′ N., and lon. 87° 57′ W., and runs nearly due south across the continent to the Bay of Fonseca on the Pacific, in lat. 13° 21′ N., and lon. 87° 35′ W. Its total length from anchorage to anchorage is 148 geographical miles, equal to about 161 statute miles. It lies wholly in the State of Honduras, whose territorial right and sovereignty over it has never been called in question. Starting at Puerto Caballos it pursues a course a little east of south, across the plain of Sula, until it strikes the Rio Ulua near the town of Santiago; thence it follows the valley of that river, now called the Humuya, to its very source in the plain of Comayagua.

At the southern extremity of this plain there is a slight elevation, which constitutes the "summit" between the Atlantic and Pacific.

Commencing then at Puerto Caballos, and proceeding southward, the leading facts connected with the proposed road will appear in their just order.

Ports.

A primary and indispensable requisite to any adequate or permanent route of inter-oceanic communication is the possession of good ports at both extremities. Upon this point I cannot do better than quote the language of an acknowledged authority on this subject, I mean that most accomplished officer and accurate observer, Captain Robert Fitzroy, R.N:—

"Irrespective of climate and political considerations, there is one chief requisite, one main point to be insisted on, in connection with any route or line intended to be available for general utility, without which, permanent success will be impossible. This indispensable adjunct is a *good port*. Without such a place of resort at *each end* of any canal or railway, easy of access, and sheltered at all times, shipping could not effect objects securely and in definite times. Delay, expense, and risk, must be the consequence of using a route unprovided with adequate harbourage."

Puerto Caballos answers perfectly to the conditions here set forth. It was surveyed by Lieut. Jeffers, U.S.N., in 1854, who describes it as "*a good harbour, of great capacity, sufficient depth of water, and easy of entrance and exit.* Situated at the base of the hills, there are neither marshes nor swamps to affect the healthfulness of the locality, which is sufficiently extensive for the formation of a large city."

The winds which prevail on the north coast of Honduras are from the N.E., N., and N. by W., from all of which the port is perfectly protected. W. and S.W. winds are scarcely known, and are, furthermore, entirely cut off from the port by the high hills and mountains skirting the coast in that direction.

It is of large capacity, being not less than nine miles in circumference. Its depth is ample, ranging, for more than two-thirds of its area, from 4 to 12 fathoms, with secure holding ground. Towards its northern shore the depth of water is greatest, and by the construction of docks 80 feet in length, the largest ocean steamers may enter and receive and land passengers and cargo more easily than in the docks of Liverpool, inasmuch as, in this portion of the Bay of Honduras, the rise and fall of the tide is almost imperceptible.

Connected with the port or bay is a large salt-water lagoon, upwards of two miles in length, by about a mile and a quarter broad, of equal depth of water with the port itself. Should it ever be thought proper, the connecting channel may be dredged so as to permit vessels to enter the lagoon, where they would be completely land-locked, and where no wind could affect them in any perceptible degree. In place of deepening the connecting channel, an open cut, a few hundred yards in length, would effect the same result.

The ground around the port is firm, and a considerable part of it cleared and under cultivation; and in abundance of good water, and fertility of soil, the neighbourhood offers every condition necessary for the building up and support of a large and flourishing town.

Puerto Caballos was selected by Cortez, in his expedition into Honduras, who founded there a town, which he called Natividad. The selection was made, to quote the language of his letter to the King of Spain, "porque es el puerto mejor que hay en toda la costa descubierta de esta Tierra-firme, digo, desde Las Perlas hasta la Florida," that is to say, "because it is the best port hitherto discovered on all the coast of the mainland, from Las Perlas to Florida." He adds, that he has made haste to effect a settlement there, not less because of the beauty of the port itself, than on account of the excellence of the neighbouring country, which he affirms was well populated and fruitful. In fact, Puerto Caballos remained for more than two centuries the principal port on the coast; but during the domination of the pirates, and the wars with the English and Dutch, it was removed, a portion of the inhabitants establishing themselves at Omoa, a few miles to the westward, and the remainder settling at Santo Tomas. The immediate cause of the change was the very difficulty urged against it by the Dr. Castilla; it was too easily entered, and, furthermore, too large to be defended, except by a number of works, while a single fort was sufficient to cover the little harbour of Omoa.

Passing, for an instant, to the other side of the continent, at the southern extremity of the proposed railway, we find the large and beautiful Bay of Fonseca, which has been justly described as a "constellation of ports." It is fifty miles in length, by about thirty in average width, perfectly protected, and contains two or three large islands, offering inner ports with ample water, and admirable sites for towns and commercial and manufacturing establishments of all kinds. The three states of San Salvador, Honduras, and Nicaragua, touch upon it. Honduras, however, has far the largest frontage. The principal port of this state is Amapala, on the island of Tigre. This is a free port, and is rapidly advancing in importance, its population and trade having doubled within the past four years. Already it possesses a large steam-mill for sawing and preparing planks and timber, which are exported even to Peru and California.

The port of La Union, in the subordinate bay of the same name, is the principal port of San Salvador, with a valuable and increasing trade.

The entrance to the bay from the sea is about 18 miles broad, between the volcano of Conchagua (3,800 feet high), and that of Coseguina (3,000 feet high), which rise like huge lighthouses on either hand, and constitute unmistakable landmarks for the mariner. On a line across this entrance are the high islands of Conchaguita and Mianguera, and a collection of rocks called Los Farellones, which serve to protect the bay against the swell of the sea.

These islands belong to San Salvador, but the principal islands, Sacate Grande and Tigre, belong to Honduras. Of these Sacate Grande is the largest, being upwards of seven miles long, and rising, at its southern extremity, to the height of 2,000 feet. The island of Tigre, however, from its position, is the most important. It is, perhaps, 15 miles in circumference, rising in the form of a regular cone to the height of 2,500 feet. The slope from the water, for some distance inland, is very gentle, and admits of cultivation. The port of Amapala has a fine anchorage for the largest vessels.

The grassy peaks of Sacate Grande, as well as of the other islands, afford a source of ever-varying and eternal beauty. With the commencement of the rainy season they are clothed with the delicate translucent green of the springing grass, which deepens as the season advances both in colour and thickness, until all the asperities of the ground are matted over with an emerald robe of luxuriant verdure. Then, when the rains cease and the droughts commence, the grass becomes sere, and finally of a brilliant yellow, and the islands appear as if swathed in a mantle of golden grain, which Ceres herself might envy. Then comes the torch of the *vaquéro*, and the sky is lurid with the blaze of the rapid flame, which clears the ground for the future fresh and tender blade, but leaves it browned and purpled, in sober contrast with its previous gayer garniture of gold and green.

The whole region round the bay is eminently productive, and capable of furnishing supplies of every kind, to every desirable extent. The lands on the banks of the rivers Choluteca, Nacaome, and Goascoran, are of the highest fertility, and adapted to the production of every tropical commodity. The savannahs at the back of these comparatively low grounds are peculiarly fitted for grazing, while wheat, potatoes, and other products of the temperate zone may be cultivated on the slopes of the mountains and plateaus of the interior. Wood, of value for the purposes of export, and for the construction of dwellings and ships, including pine, exists in exhaustless quantities on the very shores of the Bay, or may be rafted down the rivers from the interior. These rivers also afford facilities for navigation for small boats, for considerable distances inland, to points near the metal-bearing spurs or outliers of the Cordilleras.

This Bay was accurately surveyed by Sir Edward Belcher in 1839, and his chart, published under the direction of the Admiralty, precludes the necessity of any further description. Salubrious, surrounded by a country of illimitable agricultural resources, and with rich and exhaustless coal, gold, and silver mines inland, abounding in fine fish, including excellent oysters; in short, possessing all the necessities for sustaining a large and prosperous population, the Bay of Fonseca is unrivalled in its adaptation for a terminus of a great work of universal utility like the one proposed, and seems to have been marked out by Nature herself as the ultimate centre of enterprise, and the great emporium of trade on that side of the continent.

Valley of the Humuya.

Returning now to Puerto Caballos, I have to ask you to accompany me rapidly over the line between the two ports which I have just described. From Puerto Caballos, in order to reach the great plain of Sula, through which flow the large rivers Chamelicon and Ulua, it is necessary to make a circuit of about three miles, to turn the eastern end or base of the high mountain chain of Merendon or Omoa, which here finds an abrupt termination. The plain of Sula forms a triangle, with a base of nearly fifty miles, resting on the Bay of Honduras, its apex extending due south, on the line of the road in the direction of Comayagua. A portion of the plain, to the eastward of the river Ulua, is low, and during floods sometimes overflowed. Such, however, is not the case with its western half, over which the road is located. Here the ground is dry and firm, and the streams have solid banks and gravelly beds. After turning the base of the mountains behind Puerto Caballos, the road pursues a right line to the town of Santiago, where the Ulua is formed by the junction of the rivers Santiago, Blanco, and Humuya. To this point the Ulua is navigable for vessels drawing seven feet of water, and during the rainy season they may continue their ascent of the Humuya to the mouth of the Sulaco, or upwards of fifty miles from the coast.

From Santiago the line of the road continues for about ten miles over the plain, when it enters the valleys proper of the Humuya, formed between hills of from 50 to 500 feet of altitude, which, in general, come down to the banks of the river, but occasionally recede, and leave strips of level land above the reach of inundations. The slopes of these hills are seldom abrupt, and no heavy work will be required at any point. The country around is generally broken, but intersected with numerous fertile valleys. The hills are covered with the pine and oak, and on the borders of the streams exist vast quantities of mahogany, cedar, guanacaste, india rubber, and other valuable trees.

About midway between Santiago and the Plain of Espino, the River Sulaco, descending from the right, unites with the Humuya. This is a considerable stream, draining a broad and fertile valley, and extending in the direction of the rich department of Olancho. At a distance of sixty miles from the coast, the valley of the Humuya widens into a beautiful plain, called the plain of Espino, which is separated only by a range of detached hills from that of Comayagua. This plain is sometimes called Maniani. It is twelve miles long, eight broad, and surpassingly beautiful. It slopes gradually to the north, and lends its aid to the road in overcoming the summit beyond Comayagua.

It is stated that, under the crown, traffic was carried on between Maniani and Puerto Caballos, in boats. In later times, loaded canoes have descended, and Lieut. Jeffers went down in a canoe from its lower extremity. The stream is, however, very rapid, and much interrupted by rocks and shallows.

Traversing the narrow valley of the river for a few miles, amongst the hills to which I have alluded, we reach the great plain of Comayagua.

Plain of Comayagua.

This plain is situated in the very centre of the state, midway between the seas, and is not far from forty miles in greatest length, by from five to fifteen broad. Its greatest or longest axis is north and south, and nearly coincides with the line of the proposed road. These dimensions are exclusive of the lateral or dependent valleys of the streams which concentrate themselves in this basin, and form the Rio Humuya. Like the plain of Espino, it slopes gradually to the north, and thus renders the grade of the proposed road to the summit gentle and easy. Upon its eastern and western borders it is skirted by mountains five or six thousand feet high, and it consequently enjoys a climate cool, equal, and salubrious, comparing in respect of temperature with the south of France in the month of May. The hills and mountains adjacent to the plain are covered with pines, and on their summit and slopes, wheat, potatoes, and other products of the temperate zones are cultivated, and may be produced in abundance. The productions of the plain, however, are essentially tropical. Its soil is extremely fertile. In short, the plain of Comayagua offers all the conditions for attracting and sustaining, as there is abundant evidence that it formerly sustained, a large and flourishing population.

In the centre of the plain stands the city of Comayagua, the capital of Honduras, which, as we have seen, was founded in 1540 by Alonzo Casceres, as a kind of half-way house between the seas, and with the view of opening through it an inter-oceanic highway—an object which now, after a lapse of 300 years, seems on the point of being accomplished. The city now contains between 7,000 and 8,000 inhabitants. Previous to 1827, it had about 18,000, and was embellished with fountains and monuments. In that year it was taken and burned by the monarchical faction of Guatemala, and has never wholly recovered from the shock. It is the seat of a bishopric and a university. There are several other considerable towns in the plain, the principal one being Las Piedras, with a population of about 6,000 inhabitants.

The line of the proposed road pursues a direct course across the plain to its southern extremity, where there is a comparatively abrupt ascent of about 300 feet to the summit, which may be overcome by two passes, called respectively Rancho Chiquito and Guajoca. The latter presents the greatest facilities. It is not, however, as might be supposed, a rocky summit, abruptly dividing the waters flowing into the great oceans, but a beautiful valley, a savannah or natural meadow, bounded on the east by a parallel range of high mountains, and on the west by a corresponding range of hills. In this meadow, dotted over with cattle, the traveller finds two bright streams, scarcely a hundred yards apart, flowing in opposite directions. One is a source of the Humuya flowing into the Atlantic, the other of the Goascoran, falling into the Pacific. An active spadesman could reverse their directions in a single day.

From this point the high islands in the Bay of Fonseca, and the volcanoes beyond it, are distinctly visible.

The valley of the Goascoran river presents no remarkable features. It is generally exceedingly favourable for the proposed work, the line of which is traced on a table or terrace, beyond the reach of freshets, and from the narrowness of the valley interrupted by no considerable streams. The hills bordering the valley are covered with pines and oaks, and beds of fine blue limestone occur at intervals throughout its length.

Inasmuch as the engineering facts connected with the proposed railway are before the public in another form, easily accessible to all who may be interested in the subject, I shall not trouble you with them in this connection. It will be sufficient to say that the profile of the line exhibits but a single summit, 2,400 feet in height; or, to speak more intelligibly, the sum of the ascents and descents, on the whole distance of 161 miles, is 4,800 feet; considerably less than upon some of the most successful American roads of equal length, and nowhere involving a grade of more than 60 to 80 feet to the mile. Lying through a valley, parallel, and not transversely to the watercourses of the country, the amount of excavation will be exceedingly small. The principal excavations will be in approaching the summit, where there will be side cuttings in earth, or in soft sand-stone, which yields readily to the pick.

Climate, Labour, Resources, etc.

There are other considerations bearing upon the feasibility of the proposed work, such as labour, climate, and the supply of material for construction, etc., each of which merits special attention, but to which I can only devote a passing observation. On the northern or Atlantic coast of Honduras, is a considerable body of what are called Caribs, but in reality mixed Caribs and negroes, who find their principal employment in the mahogany works there, and on the coast of Yucatan. They are active, intelligent, acclimated, inured to labour, well organised, skilled in working timber and making roads, and must furnish a valuable quota to the supply of labour for the road, at the points where acclimated labour will be most required. A considerable population exists on the line of the road, and the State of San Salvador, which, as we have seen, touches on the Bay of Fonseca, is, relatively to its size, the most populous state of all Spanish America. A certain supply of labour may therefore be depended upon from the local population. The use of foreign or exotic labour will, of course, depend mainly upon the climate; and this, fortunately, (after we pass the immediate northern or Atlantic coast, which is everywhere, from Savannah to Rio de Janeiro, more or less unhealthy), is distinguished for its salubrity. The presence, in nearly all parts, of pines and oaks is perhaps the best evidence I can adduce that the country is not tropical in climate, although falling within sixteen degrees of the line. The north-east trade-winds sweep over the Caribbean Sea, saturated with moisture, which, however, is precipitated against the mountains bordering the Atlantic, so that the currents of air reaching the high plains of the interior and the coast of the Pacific are comparatively cool and dry. The natural high temperature of this latitude is further modified by the general elevation of the country, and its proximity to lofty mountains, affording a variety of climate suited to every caprice, and a temperature adapted to the productions of every zone. At Comayagua the average temperature, for three of the hottest months of the year, is expressed in the following table :—

Months (1853).	6 a.m.	12 m.	3 p.m.	6 p.m.
April (part)	75° 7′	81° 9′	84° 0′	80° 2′
May..........................	75 5	81 2	80 3	78 5
June.........................	74 4	78 5	80 8	78 3
Average.........	75 2	80 5	81 7	79 0

That is to say, during the above months, the mean temperature, from six o'clock in the morning until the same hour in the evening, was 79·1 deg. The highest or maximum points touched by the thermometer during these months was 88 deg.; the lowest, or minimum, 68 deg.; an extreme range of 20 deg. As regards health, the Pacific coast is superior to that of the Atlantic, and settlers might establish themselves around the Bay of Fonseca, with no more risk than would attend any change of climate. Amongst temperate, cleanly people, all other circumstances being equal, I have no doubt the average of life on that coast, and in the interior of the country, would be as long as in the most favoured parts of Europe. In the first place, pulmonary complaints, and that large and fatal class of diseases resulting from colds and sudden changes of temperature, are here nearly or quite unknown. Intermittent fevers are less common than in the Western States of America, and yield more readily to the usual medicines. They are, after all, pretty much confined to persons of irregular habits, who disregard the precautions necessary to health in any climate.

In respect to the materials necessary for the proposed work, it is only necessary to say, that the country possesses inexhaustible quantities of the finest white and blue marble, and sandstone; as also of the best pine, oak, mahogany, and other varieties of useful timber.

And here I may mention that this state, in common with the others of Central America, is favourable to the production of every variety of tropical staple, coffee, cochineal, cotton, cocoa, sugar, rice, indigo, maize, etc. The cocoa is indigenous, and there is a native variety of sugar cane of great value; as also of the indigo plant; and several varieties of native cotton. In addition to the well-known natural products, such as mahogany, rosewood, and sarsaparilla, we find gum copal, India-rubber, gum arabic, fustic, dragon's blood, vanilla, Brazil wood, liquid amber, Peruvian bark, etc., etc. Cattle are numerous in the state, and constitute a considerable part of the wealth of the inhabitants. Hides, therefore, which hardly pay to be carried to the coast on mules will become an important article of export, when new and cheap means of transportation are established.

Apart, however, from the agricultural resources of the country, there are other vast and undeveloped sources of wealth. There is hardly a stream on the Atlantic slope of the Cordilleras which does not carry gold in greater or less quantity, and the hills and mountains of the interior contain numberless mines of gold, silver, copper, and iron.

The silver mines are unsurpassed in the amount and richness of their ores, and there is reason to believe, with the intelligence, enterprise, industry, and capital which will inevitably flow into the country with the prosecution of the railway, that Honduras will become, in proportion to its territorial extent, the largest silver-producing country in the world.

Altogether, and looking only to local results, the establishment of regular communication with Honduras, and between its ports and the interior, will open to the world a rich and virgin field for the industrious and enterprising; create new markets for our manufactures; afford additional supplies for our use, and give a corresponding impulse to commerce and trade.

But, as I have already said, the interest of the world in that country is less as regards its latent resources and intrinsic value than in reference to the facilities which it offers for inter-oceanic communication. And now, having indicated some of these facilities, and shown, as I hope, that a railway at this point is not only practicable, but eminently feasible, I propose to notice, with equal brevity, some of the general advantages which would result from its construction.

Relative Uses of Canals and Railways.

The proposition of connecting the two seas by means of a canal has lost none of its grandeur, and in most minds very little of its vagueness, since it first occupied the attention of the Spanish Cæsars. In contemplating it, and too often even in writing about it, we are apt to give a free-rein to fancy, and to picture a fleet of vessels, freighted with the interchangeable products of the two hemispheres, avoiding the stormy Capes, and directing their prows towards a narrow strip of land, pierced by a silver thread of water, and there, in some vast metropolis, replenishing their supplies, and afterwards speeding joyfully to their destined havens. The conception grows with every succeeding survey of the chart, and unless corrected by a careful consideration of facts and figures, will most likely lead the individual into loose generalisations, deceptive to himself and to others.

That an inter-oceanic canal is most desirable, and its prosecution an object worthy of the highest ambition, is universally conceded; but its realisation will depend upon precisely those practical considerations which apply to the construction of the simplest works of public utility.

In the the first place, it cannot be expected that the commercial world will incur the vast expense of such a work, until it shall be demonstrated that the line selected for it is, in all respects, the one best adapted for the purpose. The indications made by individuals, with inadequate means, and too often founded upon conjectures which have gradually solidified into beliefs, will not be accepted as conclusive on a point of this importance. Hence, it seems to me, it is the duty of the governments of the leading commercial nations of the world, but especially of those of England and the United States, to agree in making a thorough and accurate survey of the entire isthmus of Central America, from the Atrato valley northward to Tehuantepec, with the view of ascertaining not only the relative feasibility of the various lines already proposed, but also, if any others exist, which have hitherto escaped the attention of explorers.

Not until such a survey is effected—first, to determine the best line, and, secondly, to fix the probable cost of the undertaking—can there be any real progress in determining that most practical, but least poetical, of considerations, "will it pay?"

Upon a satisfactory answer to this question the whole matter hinges, and, in undertaking to answer it, few have been sufficiently careful in their assumptions. It will not do to foot up the commerce between Europe and Asia, and assume, as has too often been done, that the totals will pass through the canal, if constructed. Now, the simple truth is, that so far as Europe is concerned, that part of her trade which goes to ports on the Pacific coast of America, to the Sandwich Islands, Japan, the northern ports of China, to New Zealand, and Australia, is all that will be materially benefited by the construction of a canal. As regards Australia, the principal advantage would be, in having a safer and easier, and, consequently, quicker and surer means of communication than is afforded by the Cape of Good Hope; for the Pacific Ocean is pre-eminently the sea of steamers, and where steam navigation, in respect of speed at least, is destined to achieve its most brilliant success. So far as the United States is concerned, the advantages of such a work would naturally be greater than to Europe.

Assuming the canal to be built across the Isthmus of Nicaragua, the following tables will illustrate the relations of England and New York, with the principal ports of the East, in respect of distance:—

	Via Cape of Good Hope.	Via proposed Canal.	Net Loss.	Net Gain.
From England				
To Canton..................	12,900	13,800	900	
Calcutta	11,440	15,480	4,040	
Singapore..............	11,880	15,120	4,240	
Sidney..................	14,980	12,550		2,320
From New York				
To Canton..................	14,100	11,820		3,280
Calcutta	12,360	13,680	1,320	
Singapore..............	12,700	11,420		280
Sidney	15,720	9,480		5,240

The distances to Sidney are calculated *via* Torres Straits.

The following table will illustrate the relations of England and New York in respect to the principal Western ports of America:—

	Via Cape Horn.	Via proposed Canal.	Gain.
From England			
To Valparaiso............	8,700	7,500	1,200
Callao	10,020	6,800	3,220
Sandwich Islands ...	13,500	8,640	4,860
From New York			
To Valparaiso............	8,580	4,860	3,720
Callao	9,900	3,540	5,360
Sandwich Islands ...	13,200	6,300	6,900

But it is not to be assumed that all the trade, much less all the travel, treasure, and mails to the points which I have indicated, will, under any circumstances, pass through a canal. The passengers, say between New York and San Francisco, amounting annually to nearly 100,000, would never consent to make a voyage of from 1,000 to 2,000 miles out of their way, to Nicaragua, Darien, or Atrato, for the sake of passing through a canal, however grand, when, by a simple trans-shipment at Honduras, for instance, and a ride of 160 miles on a railway, they would be able to avoid this long *detour*, and effect a saving of from five to eight days of time. For even if steamers were to run to any canal which might be opened, and supposing no detention on account of locks or other causes, even then it would be necessary for them to stop for coals and other supplies, more than quadruple the time that would be occupied by the passengers over the railway, in effecting their re-embarcation. And what is true of passengers is equally true of treasure, the mails, and light freight of small bulk and large value.

I do not wish to be understood as arguing against a canal; what I mean to illustrate is this, that, open a canal wherever we may, it will always stand in the same relation to a railway as does the luggage-train to the express. A canal would be chiefly if not wholly used by ships and vessels carrying heavy and bulky freights; but as most articles of this kind are kept in stock in all the principal ports in the world, it is not of so much consequence to have rapidity as constancy of supply, and hence, unless the canal shall be constructed so economically as to admit of a moderate tonnage rate, it is not improbable that ships of this kind would find it more economical to follow the routes now open.

Although three lines have been examined with reference to this point, viz., at Tehuantepec, Panama, and Nicaragua, the latter is the only one which has been *proved* feasible for a canal. This has been accurately surveyed, and its cost estimated not to exceed £8,000,000 sterling. Yet after a careful examination, by a committee of capitalists, comprising some of the first names of the world, it was found that, calculating every ton of shipping which would be likely to pass through it, at rates of toll not so high as to drive vessels to pursue their old channels, and making due allowance for the costs of repair and management, little or nothing would be returned on the capital invested. In short, "*it wouldn't pay*;" and the project was, consequently, for the time being abandoned.

That a canal will sooner or later be opened I firmly believe, but I do not believe it will be until, by the opening of railways across the continent, the commerce of the Pacific shall be sufficiently developed to enable it to pay a fair *per centage* on the cost of the work.

But under no circumstances can a canal serve the peculiar purposes of railways, as a means of inter-oceanic communication; nor can railways serve, or but to a limited extent, the special purposes of a canal. The two are not rivals but auxiliaries, and no canal will be dug until railways have made it indispensable.

Commerce of the Pacific.

I have enumerated certain countries, in the Pacific, with which commerce would be facilitated by the construction of railways or canals across Central America. The actual trade with those countries, passing round Cape Horn, or across the isthmus, carefully calculated for the year 1854, presents the following aggregates, which have since been largely increased:—

Number of vessels employed..............	3,513
Tonnage, outward bound	1,461,000
Tonnage, inward bound.....................	1,418,500
Value of imports	£8,963,000
Value of exports	£22,013,000

In other words, the commercial values which took this direction, in the year 1854, amounted to a grand aggregate of £30,976,000. This is exclusive of the Australian trade, of which but a little more than £400,000 in value, passed by the routes in question.

I shall not here discuss the probabilities of the trade of the British Australian colonies taking a direction across Central America, but content myself by saying, that, exclusive of gold, the imports and exports of these colonies collectively, for 1855, amounted to the following totals:—

Exports	£7,215,000
Imports............................	4,503,000
Or to a grand total of	£11,718,000

Of course the commerce of California now constitutes the largest item in the aggregate of trade with the ports of the Pacific. But, leaving California and Oregon aside, we find that the commerce of the United States alone, with these ports, rose from 626 vessels of 244,000 tons, in 1849, to 1,856 vessels and 957,500 tons in 1854; and that its imports and exports increased, in the same period, from 17,001,320 dollars to 33,963,000 dollars, or about 100 per cent.

Although the gold of Australia does not now flow across Central America, yet I have included its annual and aggregate product in the following table, as a possible, if not a probable future contribution to the traffic of that railway across the Isthmus which shall best meet the requirements of commerce:—

	California.	Australia.	Total.
	£	£	£
1848	12,000	—	12,000
1849	1,600,000	—	1,600,000
1850	5,000,000	—	5,000,000
1851	8,000,000	907,113	8,907,113
1852	11,200,000	9,735,903	20,935,903
1853	12,000,000	10,445,700	22,445,700
1854	13,600,000	9,028,759	22,628,759
1855	12,908,000	11,513,230	24,421,230
	£64,320,000	£41,630,705	£105,950,705

We see that gold was discovered in California in 1848, in which year the production was £12,000, rising, in 1855, to £12,908,000. It was discovered in Australia in 1851, in which year its production was £907,113, rising, in 1855, to £11,513,230. The production for 1856, in both countries, it is estimated, will show a considerable increase on these aggregates.

The gold crop of California will necessarily pass over Central America, in its direct and inevitable voyage to the great commercial centres of the world, New York and London. But this is not the whole amount of treasure which must take the same direction. The bullion of Chili, Peru, Ecuador, and the West Coast of Mexico, not to mention the present considerable, and the prospective large contribution from Central America itself, will go to swell the precious aggregate. Taking the latest official returns, and, in their default, the best estimates, we get the following annual contributions to the metallic wealth of the world, from these comparatively unnoticed sources.

Chili (1854, estimated), silver and copper ...	£2,400,000
Peru (1854, official), gold and silver	1,050,000
Bolivia (1852, estimated), gold and silver ...	400,000
Ecuador (1854, estimated), ditto ...	600,000
New Grenada, gold and silver, say	200,000
Mexico, West Coast (1854), gold and silver	1,200,000
Central America, in general, gold and silver	500,000
Total............	£6,350,000

These figures are rather below than above the fact, but, nevertheless, show that the product of the precious metals, on the western coast of the American continent, and of which the natural flow is by the speediest and safest route across Central America, amounts annually to upwards of £19,000,000, or 95,000,000 dollars, or nearly twice the average amount of bullion in the Bank of England. At the low charge of one-fourth of one per cent. the revenue accruing from the transportation of the precious metals from sea to sea would reach the sum of £50,000 per annum, or 2½ per cent. on £2,000,000, the capital of the projected Honduras railway. Add the product of Australia, and the revenue from this source would reach £70,000 annually, or nearly 4 per cent. on the same capital.

Let us now, before passing to other considerations connected with the projected work, recapitulate the annual value of that commerce which it would, to a greater or less degree, accommodate, and which is interested in its construction:—

Aggregate general commerce with the principal Pacific ports, exclusive of Australia	£30,976,000
Commerce of Australia (1855)	11,718,000
Australian Gold (1855)	11,513,000
Total...............	£54,307,000

To say nothing of the mails, there is another important element to be considered in this connection—I mean the passenger traffic between the seas—between Great Britain and Australia, and between the United States and California.

Number of Passengers going from the United Kingdom to the Australian Colonies.

Year.	Number of Emigrants sent out free by Commissioners.	Number of persons proceeding by their own means.*	Total Emigration.
1853	27,723	33,678	61,401
1854	41,065	42,172	83,237
1855	28,016	24,293	52,309

* This class of passengers is always proceeding, without reference to the others. It is impossible to say how many return *from* Australia annually.

The arrivals and departures at San Francisco, *viâ* the Isthmus of Central America, have averaged, for the past three years, 69,521 per annum. This number is irrespective of the passengers for Chili, Peru, and the Pacific ports generally, who would probably swell the aggregate to upwards of 80,000.

Saving in Time and Distance.

To meet the requirements of the vast commerce which I have indicated, and to facilitate the passage of so many thousands of passengers, so many millions of treasure, and for the transmission of the public mails, it is indispensable that we should have a safe, an adequate, and permanent route of transit between the seas. The necessity is obvious, and the sole question now is, where is that route to be found? I should be false to an honest conviction, formed after a careful study of the whole subject on the spot, and under circumstances particularly favourable to its just appreciation, if I hesitated in expressing my belief, that this route lies through the state of Honduras, and over the line which I have presented to your notice this evening. I unhesitatingly claim for it a clear superiority over all others which have yet been proposed across the Central American Isthmus, not only in respect of distance, and in freedom from detentions and delays resulting from bad ports, adverse winds, and frequent changes, but also in the excellence of its harbours at both extremities, and the general salubrity and vast resources of the country through which it passes.

I. *Distance.*—Although *time*, not distance, is the true measure of the relations of places, yet, as the saving of time depends more or less on the distance to be traversed, a shortening of distance must always be an important element in calculating the advantages of the respective routes which have been proposed between the oceans.

The distances from Liverpool to San Francisco, touching at Jamaica, by the various routes in existence or proposed, are as follows:—

Viâ Panama	7,980	miles.
,, Nicaragua	7,720	,,
,, Tehuantepec.	7,740	,,
,, Honduras	7,320	,,

The distances between New York and the same port, as also the distances from New York to Calloa and Valparaiso, are as follows:—

	Via Panama.	Via Nicaragua.	Via Tehuantepec.	Via Honduras.
New York to				
San Francisco	5,224	4,700	4,200	4,121
Callao	3,500	3,600	4,080	3,540
Valparaiso	4,760	4,980	5,400	4,800

The positive saving, in distance, which the Honduras line would afford over Panama, in the voyage from Great Britain to California, would be, therefore, 660 miles; over Nicaragua, 400 miles; over Tehuantepec, 420 miles; and, as respects the South American ports, the line would be more favourable than Tehuantepec, and nearly as favourable as the others. As regards New York and the Atlantic States of the Union, the gain over Panama would be 1,100 miles; over Nicaragua, 580 miles.

II. *Time.*—The voyages between New York and San Francisco, *viâ* Panama, for the year 1855, according to official tables, averaged 24 days 9 hours; those *viâ* Nicaragua, 22 days 22 hours. Now, as regards California, the difference between the Honduras and Panama routes, in point of absolute distance, is about one-fifth. All other circumstances, therefore, being equal, the opening of the Honduras road would effect a saving of *five days*. But the greater facilities which Honduras affords, resulting chiefly from the possession of unexceptionable ports, will augment that saving from three to five days more, or to from *eight to ten days in all;* that is to say, reduce the voyage from twenty-four days and a-half to fourteen days.

Next, as regards Australia; for the year and a-half ending January 1st, 1856, the passage of the mails from London to Melbourne occupied an average of 95 days, and from Melbourne to London 85 days. The distance from Liverpool to Melbourne, *viâ* Honduras, has been calculated with care, and found to be 12,341 miles. At an average rate of steaming of twelve miles per hour, and allowing five days for coaling and transhipment, the voyage could be performed in exactly 47 days 20 hours; or, calculating steaming at ten miles per hour, and allowing the same time for detentions, in 56 days 10 hours; in the former case effecting a saving of 47 days in the *outward*, and 37 days in the *inward* voyage.

Although the saving of distance, *viâ* Honduras, over that *viâ* Panama, in the voyage from Great Britain to Australia is but slight, still, should a line of steamers be established between the mother country and her Australian colonies, the paramount considerations of good ports, salubrious climate, the possession of coal on the Pacific, and abundant supplies, would necessarily determine the Isthmus of Honduras as the point where the continent would be crossed.

III. *Ports.*—The paramount necessity of good ports at both extremities of any work of the kind proposed, has already been made the subject of remark. As observed by Capt. Fitzroy, "it is that one main point to be insisted on without which success is impossible." I have said that the ports at both extremities of the Honduras line are unexceptionable. They are easy of entrance and exit, ample in dimensions for the largest fleets, with abundant depth of water, and good holding ground, and admitting of the easy construction of wharves, at which the largest sea-going steamers may tie up, beside the depots of the railway. This much is incontestable, and may be easily verified by an inspection of the official maps.

Now let us see how the other lines, actual or proposed, compare, in this respect, with the one under notice, commencing with that *viâ* Panama:—

In the first place, the Bay of Panama, on the Pacific, is, in no sense of the word, a port; steamers, at best, have to lie several miles from shore, and passengers, freight and supplies, have to be embarked and disembarked in small boats and lighters—an operation which can only be performed at certain stages of the tide, and in bad weather cannot be performed at all. Delay, danger, uncertainty, and expense, are the necessary results of this deficiency.

The objections to Navy Bay (the Atlantic terminus of the Panama Railway) are not equally great; but this is far from being a safe port, inasmuch as it is open to the north-east, the direction from whence blow the heaviest gales. On the 31st of December, 1854, a storm from the north-east destroyed the wharves at Colon, and wrecked every vessel in the port. The American steamer *North Star*, and the British West India steamer *Derwent*, only escaped a similar fate by getting up steam and standing out to sea. A delay of two days in embarking the California passengers, mails, and treasure, was the consequence.

As regards the proposed Chiriqui and Dulce line, the practicability of which for a railway has not yet, so far as I am aware, been tested by a survey, I have only to say, that it lies close to that of Panama, and so far as distances are concerned, would afford but trifling saving over the latter. The territory within which it falls, forms part of New Grenada, which State having conceded an *exclusive* charter to the Panama Railway, is debarred from making the necessary concession for the construction of the road here suggested. Chiriqui Lagoon offers several good ports, and the Gulf of Dulce, so far as we are informed, is also a fair port.

The Nicaragua line is simply impracticable, at any reasonable cost, for a railway. It would involve, first, a road 128 miles in length, from the port of San Juan to Lake Nicaragua, through the uninhabited valley of the Rio San Juan. To turn the Lake and reach the Pacific, would involve upwards of 100 miles additional along the southern shore of the Lake, and through a wild and uninhabited district. Or else, a transhipment would be required to cross the Lake, and another to cross the strip of land intervening between the Lake and the Pacific. Interior transhipments must be fatal to any route, looking to economy, speed, and security of transit.

The Port of San Juan de Nicaragua, on the Atlantic, is a very good port; that of San Juan del Sur, on the Pacific, small and inadequate.

The proposed "Tehuantepec Route," the only one which, in respect of saving of distance in communicating with California, can be compared with that proposed through Honduras, has absolutely no port in the Atlantic, and is, if possible, less favoured on the Pacific. It is proposed to enter the Rio Coatzacoalcos, on the side of the Gulf of Mexico; but this river, opening due north, and exposed to the full force of the northers, has only twelve feet of water on its bar, whilst the smallest of the Californian steamers, the *Falcon*, draws fifteen feet of water.

> "At high water, on the full and change, the depth of water on the bar (Coatzacoalcos) is about thirteen feet, and falls as low as eleven feet."—*Report of Tehuantepec Survey*, p. 115.
>
> "The port of Tehuantepec (on the Pacific) gives its name to the hurricanes which blow from the N. W., and which prevent vessels from landing at the small ports of Sabinas and Ventosa. —*Humboldt's New Spain*, vol. i. p. 26.
>
> "It would be necessary (to open this route) to remedy, if possible, the want of a moderately convenient port on the Pacific. Tehuantepec scarcely deserves the name of a roadstead; the sea recedes day by day from its shores, and the anchorage yearly becomes worse."—*Michel Chevalier, L'Isthme de Panama*, p. 66.
>
> "In the season of 'Norths,' great risk would attend the approach of vessels to that part of the coast (Coatzacoalcos), where there is neither port nor shelter nearer than Vera Cruz, 120 miles distant to the N.W.; and during 'Norths' the land thereabouts is not only a '*dead lee shore*,' but forms a perfect '*cul de sac*,' out of which sailing vessels could not escape under canvass."—*Capt. Liot, Superintendent of British West India Mail Steamers.*
>
> "The Gulf bar cannot be considered as affording more than twelve feet of water. Upon the Pacific side there is no harbour." —*Col. Abert, Chief of United States Topographical Bureau.*
>
> "In regard to the approaches on either side, Nature has been unkind; and Ventosa Bay, on the Pacific, is, in its very name ('Windy'), an apt expression for the character of the roadstead; while on the Coatzacoalcos side there is nothing to protect the entrance of the river from the northers of the Gulf of Mexico."—*J. H. Alexander, Congressional Report*, No. 145, 1849, p. 44.
>
> "The whole shore of Tehuantepec is subject to the visitation of terrific hurricanes, sweeping with resistless fury along this inhospitable coast, where the tempest-tossed mariner seeks in vain for a harbour of refuge, even for the smallest class of sea-going vessels. For this there is no remedy: the genius of man cannot control the storms, and nature is constantly interposing new physical difficulties in the way of navigation."—*Colonel Hughes, U. S. Topographical Engineers, Report to the Sec. of State of the United States.*

I have said, and may here repeat, that none of the ports on the Atlantic coast of America, around the Gulf of Mexico and the Caribbean Sea, can be regarded as healthy. They, however, differ very widely in this respect; some, like Vera Cruz and Chagres, having earned the ghastly title of the "Graveyards of Europeans." Much depends upon the proximity of highlands, the absence of marshes, and the direction of the winds. In these respects Puerto Caballos is comparatively highly favoured; the mountains are close by, affording, on their slopes, at different altitudes, a thermometrical variation of 20 degrees. It has, moreover, at its back, a country as salubrious as any under the tropics. The yellow fever has never been known there, or at Omoa, six miles to the eastward, except, as at Belize, in the form of sporadic cases.

TRANSMISSION OF INTELLIGENCE.

Let us consider, for a single moment, the relations in respect of transmission of intelligence which the proposed work would open up. I take it for granted that the Atlantic telegraph will be laid down within the present year, and thus put this metropolis in, I may say, instantaneous communication with every part of the United States—with the far-off prairies, and with the southernmost Capes of Florida. From the point last named to Havana, in the island of Cuba, is but 130 miles, and a submarine telegraph to connect the two points is already under contract. Communication between London and Havana being thus established, it will be easy to continue the connection still further to the Bay of Fonseca. To accomplish this object it will only be necessary to construct 180 miles of land telegraph to Cape San Antonio; 270 miles of submarine telegraph, thence to the British establishment at Belize; 120 miles of submarine telegraph thence to Puerto Caballos, and 161 miles land telegraph (which would naturally be constructed by the railway company itself, for its own convenience) to the Bay of Fonseca. That is to say, assuming the telegraph connection with Havana complete, a supplement of 340 miles land, and 390 miles submarine telegraph, at an outside cost of £50,000, would complete the communication between London, New York, Havana, and the Bay of Fonseca! In other words, it would put this metropolis within 8 days of San Francisco, 6 days of Callao, 10 days of Valparaiso, and 30 days of Australia.

At present, the naval stations, both of the United States and Great Britain, in the Pacific, are established at Valparaiso. Orders from England to the Pacific squadron have, therefore, not only to traverse the Atlantic, but nearly the whole western coast of South America, to reach their destination. Now, as nearly all the points in the Pacific, where the services of national vessels would be required, lie not only to the northward of Valparaiso, but to the north of the Equator itself, it follows that vessels assigned to any specific duty would be required to sail back over the line which their orders had traversed, and, in case of sailing vessels, be subject to weeks of detention in passing the latitude of calms and variable winds. Thus, if a steamer were selected for duty, say at Acapulco, on the coast of Mexico, her orders would have to go 2,880 miles out of the way to reach her in Valparaiso, and the vessel afterwards would be obliged to sail 3,480 miles to arrive at her destination! The time, between the issue of the order, and its execution, under no circumstances, could be less than 40 days!

Let us imagine the Bay of Fonseca, which has every facility for the purpose, to be fixed upon as a naval station in the Pacific, and the telegraphic communication complete. In such event, orders issued from the Admiralty would be able to reach the Pacific squadron within a single day, and, in the supposed case of a vessel destined to Acapulco, be executed within 4 days from their issue. And what is true of Acapulco, would be true, in equal proportion, in the discharge of whatever service might be required of a squadron in the Pacific, whether on the western coast of America, the eastern shores of Asia, or at the islands of the Pacific.

Hence I deduce, and I believe fairly, the importance of the proposed work in a governmental and executive point of view.

Charter and Guarantees.

I have now laid before you the general features, and indicated some of the necessities which exist for the construction of the proposed road, and pointed out some of the advantages, intrinsic and comparative, which it will afford. It now only remains to inquire, *first*, what facilities have been offered by the government of Honduras itself to promote the enterprise? and, *second*, what guarantees are afforded that it shall be secure against local disorders, or foreign interruption, when constructed? *First*, the government of Honduras has conceded a charter for the enterprise of the largest liberality, which fully recognises and practically embodies those principles of freedom of trade which, starting from this island as a centre, are radiating all over the world. The charter is exclusive for 70 years from the opening of the road, at the end of which time the works are to be purchased by the State, at a valuation, or the charter continued in perpetuity. It concedes, in aid of the undertaking, and as a guarantee of interest, the fee simple of 2,250 square miles of land, on or near the line of the road. To encourage emigration and the introduction of skilled labour, it gives a bounty of 75 acres of land to every married labourer or artisan who may be engaged for a specified time on the road. It exempts such of the citizens of the State, as may be in the employ of the road, from public service. It makes the road, when constructed, open and free to the people of all nations; provides that the ports at both extremities shall be free ports; that all property *in transitu* shall be free of duty; and that no passports shall be required of passengers. In short, it makes every desirable concession, and offers every facility for the travel and commerce of all nations, and, in this respect, affords a model of liberality and wisdom.

Second.—What guarantee against local disorders or foreign interruption? I answer the guarantee of the three most powerful nations of the globe,—England, France, and the United States, by joint treaties, or treaties direct with Honduras. The following passages from the treaty between Great Britain and Honduras, which has been equally accepted by France, and which Honduras has bound herself to incorporate in every treaty she may make with other countries, sets forth, that Great Britain, "*in order to secure the construction and permanence*" of the road in question, "*and also to secure for the benefit of mankind the uninterrupted advantages of such communication from sea to sea, guarantees positively and efficaciously the neutrality of the same*," and "*engages, in conjunction with Honduras, to protect it from interruption, seizure, or unjust confiscation, from whatsoever quarter the attempt may proceed.*"

In consideration of such guarantee, the government of Honduras, on its part, agrees that "the right of way or transit over such route or road, or any other that may be constructed within its territories, from sea to sea, shall be at all times open and free to the government and subjects of Great Britain, for all lawful purposes whatever; that no tolls, duties, or charges of any kind, shall be imposed by the government of Honduras on the transit of property belonging to the government of Great Britain, or on the public mails sent under authority of the same, nor on the subjects of the British Crown; that all lawful produce, manufactures, merchandise, or other property belonging to subjects of Great Britain passing from one ocean to the other, in either direction, shall be subject to no import or export duties whatever, nor to any discriminating tolls or charges for conveyance or transit, on any such route or road as aforesaid, and shall be secure and protected from all interruption or detention, on the part of the state; and, finally, as an evidence of its disposition to accord to the travel and commerce of the world all the advantages resulting from its position in respect to the two great oceans, Honduras, of her own good will, engages to establish the ports at the extremities of the contemplated road, as free ports for all the purposes of commerce and trade."

Conclusion.

And here, in a Society devoted to the arts and the glories of peace, it seems to me it will not be out of place to offer a word of congratulation on the probable happy solution of those differences in respect to Central America that have so long disturbed the friendly relations between the United States and Great Britain, which it is equally the duty and policy of both to foster and preserve. A twelvemonth has not passed since we saw, and every man interested in the welfare of humanity and the advancement of civilisation saw, with surprise and alarm, the rival fleets of the two first commercial countries of the globe concentrating in the waters of the Caribbean sea, and there taking up an attitude of mutual defiance, ready to appeal to that bloody arbitration which is the last resort of nations. For months the peace of the world depended upon the discretion and mutual forbearance of a score of naval commanders. A fancied insult on either side, the firing of a single unlucky gun, would have roused that indomitable spirit which finds expression in the grim motto, common to both, "we die but never surrender." I will not dwell upon the consequences which we all know would have followed on such a catastrophe, and in the contemplation of which the cheek of the boldest might well grow pale.

Thanks, however, to that spirit of moderation and wisdom which, in spite of momentary excitements, holds a steady sway over the councils of both countries, the differences to which I have alluded have been amicably and honourably adjusted, and the principle, that the great inter-oceanic highways through Central America shall be open and free to all nations on equal terms, has received the solemn sanction of both governments. To establish it may have cost the abandonment of valueless pretensions, and even of doubtful rights; but what are these in comparison with the great positive advantages thereby secured, the smallest of which outweighs tenfold all that could have been gained from a contrary policy?

Let us hope that with the settlement of this question the last cause of difference between the two countries has disappeared for ever, and that the white-winged dove of peace which recently reached these shores, shall be received as she was sent, as the messenger of the "love and respect of the people and Congress of the United States to the Queen and the people of England."

Let us hope that, side by side, the capital and enterprise of both countries shall strive, in all frankness and good faith, to open across the American continent those ways of communication which, by augmenting commerce, creating new markets, cheapening imports, and above all, by giving active and remunerating employment to industry, shall add to the wealth and increase the prosperity of each. Not that I would urge these purely selfish considerations alone, for apart from the new fields which these works would open to enterprise, they would tend equally to that diffusion of light, knowledge, and civilization, which always follows upon any great improvement in the physical condition of mankind, and which extends with every saving of an hour's time or a mile's distance, in the intercourse between nations. The conjunction of time and circumstances seems favourable for the undertaking. The "Star of Empire," which in its westward progress stood still for a while on the crest of the Cordilleras, is now reflected in the tranquil waters of the Pacific. The hardy and adventurous sons of a common stock, working their steady, unwavering course around the globe, now stand upon the high Capes of California, and the easternmost cliffs of Australia, and with outstretched hands shout, "Hail, brother!" across the intervening sea! They came to regions desolate and savage, or dead under the incubus of an effete nationality, and the sands beneath their feet have turned to gold. They built their huts on the shores of an untracked ocean, and lo! its bosom is whitened with the sails of a countless fleet, and its horizon streaked with the smoke of those giant steamers, which, freighted with a wealth exceeding that of the ancient galleons, push aside the waves along the shores of an entire continent!

Blind indeed he must be, who fails to discover in these grand results the evidences of a high design, or who fails to perceive that a great over-ruling power has placed the standard of civilisation in the hands of a chosen people, and bidden it to go forth "conquering and to conquer;" not by force of arms so much as by the force of an energy, working by example, constant and inflexible, and through the medium of institutions, which, however, they may differ in form, agree in principle, and are equally adapted to the infant colony or the powerful republic, and under which alone the capabilities of men attain their most vigorous development. Let then the members of the great Teutonic family, chosen of God, recognising their mission, prove faithful to their duties; and wisely, and with mutual forbearance, making use of that national and commercial pre-eminence which their elastic institutions and individual superiority have qualified them to attain, gird the world as with a hoop, vivifying dead nations and emancipating mankind!

DISCUSSION.

Mr. **Trelawney Saunders** said—Viewing the various projects presented to the world for crossing the Great Central American Isthmus, he was bold to say, that none appeared to him to offer so many promising features, or so much prospect of collateral advantage, as that now laid before them by Mr. Squier. Whether they considered the Tehuantepec route, or the present route across the Isthmus of Panama, or the route by Lake Nicaragua, or the proposed Honduras route, or indeed any other—in every instance the paramount object must be to combine the advantages of good ports, with a transit through a country capable of being developed by a race of men requiring a temperate and salubrious climate. No proposed route appeared to combine these advantages in the same degree as that presented to their notice by Mr. Squier. But, while allowing all this, there were two or three advantages which the author of the paper claimed for his route which he (Mr. Saunders) would hardly be disposed to concede. He admitted, that for the purposes of the United States, the line now proposed offered greater advantages than probably any line within the territories of the United States—that it afforded the most facile access southward between the eastern and western shores of their territories; but when Mr. Squier claimed for Fonseca the establishment of the British naval station, instead of Valparaiso—if the question of removing the Pacific naval station was raised—there was, he thought, another site which had greater claims than even Fonseca. He alluded to our own possession in the Pacific, Vancouver's Island, which had been frequently recommended as offering special advantages for a naval station, in the great facilities which it possessed for communication with the mother country, and particularly in reference to Canada. Those advantages must not be overlooked. With regard to the proposed route in connection with our communication with our Australian colonies, he thought there were very few relations existing between Australia and Central America calculated to divert the communication between Australia and the mother country to a western route. He thought the natural relations of Australia with our Asiatic possessions—with Asia generally—and the facilities afforded by the overland communication by way of the Mediterranean, which was likely to be improved—which was likely at no very distant date to be developed by telegraphic communication—that all these circumstances pointed out the natural route from this country to Australia to be by way of Asia in connection with our Asiatic possessions, and he thought the object should be the development of British capital and enterprise in that direction. It was to be observed that the voyage from Australia to Central America must be a profitless voyage—whereas the voyage to Australia by way of our Asiatic possessions was already occupied by a traffic of the greatest importance, which was likely to develop itself in a manner they could hardly anticipate. But so far as the communication between the eastern and western portions of the United States was concerned, the facilities afforded by the Honduras route were undoubtedly much greater than those afforded by the Pacific route, or by the formation of a railway on the southern boundaries of that territory. He might further allude to the advantages we at present possess for communication with the Pacific by means of our own territories, but he thought he had said enough to call forth reflection upon this paper, which abounded in important and interesting matter for the consideration by this Society.

Mr. **Thos. Webster**, F.R.S., agreed with the last speaker that the interesting and important paper they had heard read deserved the deepest consideration, but the magnitude and importance of the subject might prevent many persons from speaking upon it. With regard to the importance of the union of the Atlantic and Pacific oceans, there could not be two opinions. A more magnificent or important project with reference to the commerce of the world or the union of all nations could not possibly occupy their attention. He was glad to find that this Society had taken up so early in the session a subject which had more or less occupied the attention of the other kindred societies in the metropolis in the last year. There was one paragraph in the paper to which he gave his most hearty concurrence, which was, that at some time or other the Atlantic and Pacific oceans must be united by a canal. He looked upon it that a canal which would admit the passage of vessels from one ocean to the other, without locks, and at all times of the tide, with the same certainty as they would traverse the other parts of the ocean, was the object to which commercial men ought to direct their attention. That this was a thoroughly practicable scheme had been demonstrated, not only by the researches of Mr. Kelly, of New York, who had expended large sums of money from his own private fortune in exploration and surveys, but if they would not trust to the researches of their brethren of the United States, he was quite satisfied to rest upon the testimony of the scientific men who expressed their opinion upon the communication on this subject, which was brought forward by Mr. Kelly, in this country, last year, namely, that the scheme was quite practicable somewhere about the place that he proposed—a plan originally suggested by the great Humboldt. That was a question which they ought never to lose sight of, not that he would wish for a moment to disparage the scheme which had been advocated in this paper, or any other scheme of the like purport, because if there was any prospect of a railway being carried across that isthmus, it was a matter to which they ought to give the utmost assistance in their power. But whatever railway communication they might succeed in establishing in that quarter, in his opinion it could never supersede the necessity for a ship canal, and unless the latter was clearly demonstrated to be impracticable, it was an object which ought never to be lost sight of by the commercial world. He was quite satisfied, from the position of the author of the paper, that he must be fully acquainted with the various projects that had been started in reference to this matter. The paper referred to the question of a railway over different parts of the isthmus, and alluded generally to the question of a ship canal to connect the two great oceans. But the meeting generally might not be acquainted with the scheme which he would place in contrast, namely, a canal for connecting the Atlantic and Pacific Oceans by the valley of the Atrato. Upon this he would remark that the surveys had shown that at the proposed points of junction the mean level of the tides in both oceans was about the same. Mr. Kelly had ascertertained this, in which he was confirmed by Capt. Lloyd, and by the experience of those who were engaged in the Panama line, who found that at the point proposed there were bays forming good harbours. Under these circumstances, and if there were no extraordinary difficulties of country—even if a large mountain tunnel were required, they knew what their engineers were capable of accomplishing in the way of tunneling. If the cost were heavy for a tunnel such as Mr. Kelly suggested in his plan, yet having regard to the great value and importance of such a project, they ought never to lose sight of it. In offering these few observations, he wished to be understood as not detracting in the least degree from the value and importance of the scheme propounded by Mr. Squier; but, inasmuch as their object was to discuss all these projects, they ought not, he thought, to lose sight of that which would afford those facilities to the commerce of the world, which it was the object of this Society, amongst other things, to encourage and promote.

The Chairman said he had the very pleasing duty to propose that the thanks of the meeting be given to Mr. Squier for the interesting paper he had read, and he hoped he should be the medium of conveying a unanimous vote of thanks to that gentleman.

The vote of thanks having been passed,

Mr. Squier had a word or two to offer on the interesting remarks of the two gentlemen who had just spoken. The objections which he (Mr. Squier) had adduced against Valparaiso as a naval station, applied with equal force against Vancouver; the former was at one extremity of the continent, the latter at the other; there were no countries where the service of public vessels would ever be required to the southward of Valparaiso, nor to the northward of Vancouver. Besides, communication with Vancouver, unless a telegraph were to be constructed from sea to sea, through the vast, savage district, through the thick forests, and the wild Indian tribes, to the northward of the great lakes, until then, at least, orders would require to go 3,000 miles or upwards out of their way in order to reach Vancouver. As to communication with Australia, it must be borne in mind, that any route going eastward, must leave out half of the commercial world, viz., America, which had not only extensive, but growing relations with Australia. The question was, whether there should be two lines of communication, one for what might be called the European, and the other for the American trade, or whether these should be combined in a single line, concentrating the resources which would be diffused over both, in one vigorous, *paying*, weekly line. Again, any line going eastward necessarily left out New Zealand, which would fall into the course of a line *viâ* Central America. As he had said, the question of a canal was, after all, one of *per cents.* He yielded to no one in his appreciation of the importance of such a work, and he felt sure, that when there was a clear prospect of its affording a fair return on the capital it would require, then it would be built, and not until then. But he had no hesitation in saying, that the present commerce with the Pacific, which, under any reasonable probability, would go by a canal, would not meet this condition. Leaving out of the question the feasibility of the proposed Atrato canal, he would ask where were to be obtained the revenues to support it, and yield a *per centage* on its estimated cost of £30,000,000? Exclusive of the gold, mails, passengers, express freight, &c., which would not go by a canal, the total commerce of Europe and the United States with the Pacific ports fell below £20,000,000. Add the commerce of Australia, and then it would not exceed £30,000,000; and it would require a charge of at least 10 per cent. on that amount in order to support the canal, and pay a fair interest on its cost. But such a charge would effectually prevent vessels, except in rare instances, from going through a canal. Hence, he (Mr. Squier) was again led to the opinion advanced in his paper, that no canal could be constructed, as a commercial enterprise, until railways and other means of communication across the continent had developed the commerce of the Pacific to four or five times its present proportions, and until it should become so large, that a reasonable toll levied upon it should be sufficient to support the canal and pay a fair return on its cost.

The Secretary announced that on Wednesday next, the 28th instant, a paper, by Mr. John Anderson, Inspector of Machinery, Royal Arsenal, Woolwich, "On the Application of Machinery in the War Department," would be read.

CROSBY HALL.—REV. DR. BOOTH ON COMPETITIVE EXAMINATION.

On Thursday evening, the 15th inst., the inaugural lecture to the Evening Classes for Young Men, was delivered by the Rev. Dr. Booth, F.R.S., at Crosby Hall, Bishopsgate-street, Col. Sykes, F.R.S., Chairman of the East India Company, and Chairman of the Council of the Society of Arts, in the chair.

Dr. Booth spoke as follows:—In appearing before you this evening, I have determined to address my observations not so much to you who come here to while away an idle hour, as to those young men who are already members of, or are about to join the classes in this ancient hall. It may be, that some who attend here this evening shall hear from me, or rather from those who will address the meeting after me, advice to direct their judgment, or arguments to strengthen their resolves, or words of encouragement to uphold them in the labours they have entered upon. I wish to speak particularly to those who are entering on the race of life, weighted, it may be, with poverty or home sorrows, the ailments, perhaps, of a bed-ridden father, or the wearing grief of a widowed mother, or the growing claims of little brothers and sisters. But may it not be here as in athletic games, in which men purposely carry weights that they may throw themselves forward in the leap with the greater force and impetus. May it not be, I say, that domestic trials, the *res angusta domi*, but urge you the more strenuously to unwearied exertion, and supply the most urgent motives to inflexible perseverance and unbending adherence to that integrity without which no man, even in a temporal sense, can ultimately prosper.

There are doubtless many here to-night who sympathise, deeply sympathise, with those to whom I refer; and that wide-spreading, all-pervading sympathy descending from the classes above on those below is by far the most assuring aspect of the times in which we live. Only think of the Chairman of the East India Company fifty years ago presiding over a meeting for opening classes to teach clerks or artisans, or a nobleman giving lectures at a Mechanics' Institution, or well-born, tenderly-nurtered, highly-educated women, taking on themselves the loathsome duties of common hospital nurses for common wounded men far from home, leaving the refinements and comforts of their English fire-sides, braving the horrors of war, the inclemency of the climate, and the innumerable hardships incidental to the trying duty they had voluntarily and cheerfully undertaken.

I have spoken so much lately, from time to time, on this question of education, that I have left myself hardly anything new to say about it; and as all I have said has been published through the powerful and expansive agency of the press, I am precluded from adopting a course very convenient for lecturers, that of hashing up an old lecture for the entertainment of a new audience. However, as I am here, let me avail myself of the opportunity to make a few practical remarks, and to address a few words, as well of caution as of encouragement to the young men I see here before me this evening.

Now, in the first place, I would observe that the disadvantages you labour under are, so to speak, accidental—not inherent to your condition. They are not such as require some external power to remove. You may be hard worked, you may have to rise early and go to bed late, you may have but few holidays and but little amusement, you may have many calls and pressing claims upon your earnings, but you belong to no caste, you are members of no subject race, you are fettered by no law, you are crushed by no custom, you are banned by no prejudice, you walk erect as Englishmen; the gates of the temple of knowledge stand wide open to receive you, if you have only the ability and the perseverance to climb the steep ascent on which it stands. The broad road to advancement stretches far away before you, till it is lost in the horizon. A very long, rugged, and heavy road some find it to be. This, however, must be said: no artificial obstacles are thrown across it to impede you in your journey.

To you, young men, this is a great matter. You have no artificially contrived disabilities to contend against. Nay, more, it matters not whether you are native-born Cockneys, Yorkshiremen, or Welshmen, Irish or Scotch, Canadians or West Indians, every post and honour in the state—save one—is open to you, if only God will prosper your efforts. Of what other nation on the face of the earth can this be truly said! Thank God, you are citizens of such a country.

Now do not mistake me. Do not for a moment imagine that I expect you to join these classes with the confident expectation, that by so doing, you are all, through diligence and industry, to rise to some high social position or other on which you may have set your hearts beforehand. You must guard against this. It is no better than day-dreaming, and you are sure to be disappointed. No. Enter the classes with the hope that, under God, your diligence and industry, your energy and perseverance, shall lead you to something better than your lot at present. Leave the issues in the hands of Him who decides better for us that we can for ourselves. You are young, and the wide world is before you. Take Columbus as your example, who boldly embarked on the solitary and shoreless ocean before him, in the sure conviction that he would at length, with Providence his guide, reach some point of that unknown coast he was in quest of. He did not much care in what latitude or climate the object of his voyage should be attained.

Now to you who are about to join the classes in Crosby-hall, I would give this advice—Take up those subjects for which you have a natural taste, and which are likely to be of most value to you in their application to the ordinary business of life. Thus, if you are in the office of an engineer, architect or builder, practical mathematics will be of much use to you. If you are engaged in manufacturing processes, you will find that you can make no way without a knowledge of chemistry; and the more profound your knowledge the safer and cheaper will your applications of that knowledge be. If you are engaged in commercial houses an acquaintance with foreign languages is likely to be of much use to you. A clerk who, to his other qualifications, adds a knowledge of German or Spanish, or French, is of much more value to an employer who has business to transact in these languages, and he is paid accordingly. And here by the way, I may observe, how much the study of modern languages is neglected in a country which has more dealings with foreign nations than any other in Europe. In our best schools, with few exceptions only, German and French are taught, and these not as essentials, but as extras, if there happens to be a vacant hour in the time table, into which other subjects cannot conveniently be thrust. I would, moreover, advise you, if you do not find yourselves altogether misplaced in the position of life which it is your lot to fill, and ill-qualified to discharge its duties, seek not to change, but rather aspire to excellence in the pursuit, you have chosen. And, above all things, be thoroughly sure of this, that there is nothing in the decay of a wretched existence, or in the decline of mispent years which kindles a more lively remorse, or clouds more darkly the evening of a troubled life than the retrospect of misspent time, and the vivid recollection of hours unprofitably wasted,

> "Oh, misspent youth, how prodigal of time."

How may you hear sometimes, and still more often know, of some old broken-down pauper lamenting how that great banker or merchant, Mr. So-and-So, was in the same office with me,—we were clerks together. He was always poring over some book or other, while I used to go to the tavern or the theatre. I was wont to laugh at him and call him poor spirited. He now lives respected, with every blessing around him, while I am houseless and homeless. He walks erect before men, whilst I slink back to my lonely garret.

Again, to you who are not over-quick in learning, I would say, be not disheartened. Learning is very often like gain, "soon got, soon gone." Some persons learn with surprising quickness, but soon forget what they thus soon learn; while others learn very slowly, but retain what they do learn with astonishing tenacity. Some men's brains would seem to be as soft as curds, while those of others are as hard as ivory. Therefore, aptitude is, in itself, without reference to other qualities, no criterion of the intrinsic power or value of any man's intellect. Slowness frequently arises, not from stupidity, but from the resistance the mind exhibits to contemplate arguments or examine facts from new points of view. No one considers that the softness of lead is more to be prized than the hardness of silver. Besides, a man may have a fine intellect, but not possess the moral qualities which would enable him to use it to the best advantage, such as decision, promptitude, energy, and perseverance. Much in the same way as a woodman may have a very fine and keen axe, but of what use will it be to him, if his arms are paralysed? Or as a man may be a capital cricket player, but of what avail is his skill, if he has got the gout in his feet? Do not any of you be led away by that most mischeivous opinion, that a man learns in proportion to the clearness and depth of his understanding; it is very much more in proportion to his eagerness, energy, and determination. Again, do not be cast down because you cannot rate your progress from day to day. Do not be like quick-growing boys, every now and then putting their backs up to a door or smooth wall, and scoring, to see how much they have grown since the last time. Be assured of this, that nothing you have once learned is ever wholly erased from the memory. It may be smirched and blotted, but there it remains. You may have forgotten it, that is, you may not be able to recall it by any voluntary act of the memory or power of the will, but how often does some violent emotion, or it may be the burning heat of a fever, bring out, in all their original vividness (like an obliterated inscription on some old coin) things that have lain, unnoticed and forgotten, in that queer old storehouse, the human mind. Therefore, what you now learn will leave its track in the mind, though the thing learned may pass clean out of your memory. Like those old quarries we read of in Pentelicus or Paros, though the blocks of marble, the material of the breathing bust or godlike statue have gone, never more to return, yet the ruts of the wheels which bore them, the grooves in which the waggons ran, are as fresh and sharp as if they left off running only yesterday. Be sure then, whatever you learn, be it for good or evil, will tell some time or other, most likely not directly but indirectly. "The bread that is cast upon the waters will be found by you after many days." Mathematicians say, that if a stone be dropped into the sea, the vibration thus produced will be transmitted to the profoundest depths of the furthest ocean. We all of us know, what would literally be incredible, if it were not actually a common fact in the mouths of common men, that a vibration, or force, or fluid, or something (whatever you please to call it does not much matter), is transmitted with inconceivable velocity along metallic wires, to, it may be, immeasurable distances. The proverbial and figurative speed of thought is here outstripped by an actually demonstrated physical motion. We know, moreover, that no single particle of matter has been lost or annihilated since the creation of the world. It may assume ten thousand different shapes, like Proteus in the old Greek legend, but it continues, through every scene and change, identically the same. If, then, the Almighty be so conservative of matter that no single particle of it is permitted to be wasted or lost, is it a forced analogy to surmise that he is equally conservative of the emanations of the mind, especially as I have shown that thoughts, though forgotten, are not lost; though beyond the power of the memory to recal, yet there are states of mental excitement, when—

> "A thousand fantasies
> Begin to throng into the memory,
> Of calling shapes and beckoning shadows dire,
> And aery tongues that syllable men's names."

Hence, what you learn is no little matter; it tinges, as light transmitted through coloured glass, every act of yours and not yours only. If with our present finite capacities and limited means of knowledge we can clearly trace the action of mind upon mind, just as we can compute the attraction of matter upon matter; if we can legibly decipher the impress stamped on the hearts of successive generations by such men as Shakespeare, Newton, Bacon, Galileo, Columbus, Luther, and other great benefactors of mankind, who shall calculate the whole efficient force and living influence which any one generation actually brings to bear on those which follow. Even though "dead it yet speaketh." Think you not that the noble deeds of men live in those who come after them. Would England be the England it is if we had no history. Who shall compute the full force of the influence produced on the mind of the nation by the noble deeds of heroism therein recorded. Who is there amongst us so cold as to read unmoved about Cressy or Agincourt, or the Invincible Armada, or the fires of Smithfield, or the burning of the bishops? The actions of men do indeed live after them. Do not imagine that the deeds of those whose bones lie buried on the stormy heights which frown over the iron-bound coast of the inhospitable Euxine, shall not tell upon the destinies of generations yet unborn. It is not so. We are all parts of one vast system, and we have each of us our work in that vast system to perform. Well is it for him who does the work that is given him to do. We are each of us links of one great chain, and the iron link is quite as necessary as the link of gold.

Let me now address to those who are about to join the classes in this hall a few words of friendly advice and much needed caution, a caution which the liberality of the supporters of this institution renders the more necessary. Some of you may have the notion, I hope they are but few, that as books and apparatus are here provided, and the assistance of able teachers secured, you have therefore nothing to do but saunter in at the proper time and listen patiently to what the lecturer has got to say about the subject you desire to learn. Now let me tell you, and I may save you both time and money by the information I am going to give you, namely, that all any one of you would be likely to learn by that mode of procedure would hardly be worth the price of the shoe leather he should wear in walking to this hall. What you want is to work knowledge inch by inch into your own minds,—not to listen to a man who has got it already, dealing it out by the fathom. You can no more think with another man's knowledge than you can walk with another man's legs. Let no man deceive you. The acquirement of knowledge of any kind worth having, is a work both of time and labour. It is heavy drudgery, at any rate at first. To learn a language especially, if you are at all advanced beyond youth, will try both your endurance of labour and your powers of perseverance. All the books and apparatus here provided, all the teachers employed, can do no more than direct and smooth your labours. You work with better tools, that is all. None of you would be so foolish as to imagine that a carpenter's apprentice could learn his trade by being furnished with a chest of new and sharp tools, instead of old and blunt ones. Good books, good maps, good teachers, are only the chest of sharp tools of the joiner's apprentice. He must, whether his tools be sharp or blunt, learn his trade in the sweat of his brow, just in the same way as you must learn a language or a science by the sweat of your brains.

You have, I dare say, most of you, learned to dance. Now, you did not attend lectures upon the accomplishment of dancing. You learned to dance, by doing your steps and going through your figures first awkwardly and in a bungling manner; gradually you came to go through them more gracefully and more correctly. Your dancing-master, you will recollect, did little more than make you keep time, and when you went wrong, set you to do your steps over again, until you could go through them more correctly. Believe me there are a great many things as well as dancing that you must learn in the same way. Trust me you can do but little in the way of learning either literature or science, unless you bring into the study of it a large capital of hard work. Why, if it were otherwise—if books, apparatus, teachers, and lectures, were all that was required, every rich man amongst us would be a Solomon, which I presume no one would assert even in the city of London. The millionaire might furnish himself with what languages he wanted, as he does with clothes from his tailor, or buy his sciences as he does his horses. Why, if everything were to be done by books, apparatus, lectures, and teachers alone, how could the poor man ever rise at all? Now, I think it right to speak thus plainly to you, lest you should imagine that you will have nothing to do but to come here punctually, listen attentively, and go away, without giving further thought to the matter until the next evening lecture comes round. It is no wonder such absurd notions should prevail, when we see advertised, "French taught in six lessons or German in ten." Only think of learning in six or ten lectures what many spend their whole lives without being able perfectly to acquire. It is much better you should know at once the hard fact and stern truth, because, when after attending perhaps sixty lectures, you should find your knowledge at best but elementary and vague, instead of being profound and clear, you might naturally suspect yourselves of dulness or your teacher of incompetency, or both, and regret that you did not repair to the mill of the six-lesson conjuror, who puts in a raw Cockney at one end, and with six turns of the handle, delivers him out at the other, discoursing most eloquently in Parisian French.

There is another reason why I insist so much on this point. Many of you doubtless intend to come up to the Examination of the Society of Arts, which will be held at their house in the Adelphi during the first week in June next, to compete for a portion of the £500 we have to give away in prizes, and for our certificates as well. Now, our respected chairman (Colonel Sykes) will tell you, who, watchful as Janus in the old heathen mythology, keeps one face fixed on our vast Indian Empire, while he turns the other on the progress of that national education which, when fully developed, can alone qualify us to wield the sceptre of those vast dominions—Colonel Sykes, I say, as chairman of the Council of the Society of Arts, will inform you, that mere smatterers or dilettanti listeners, will gain but little by coming up to our examinations, that the prizes, certificates, and rewards, will (if the Society's Board of Examiners can secure the result) be given to the industrious and the diligent.

Now, some of you may say, and more think, well, we thought we should have nothing to do but to pay our money and attend the lectures one or two evenings a week; that we should find it as amusing as listening to one of Mr. Thackeray's lectures, as entertaining and requiring as little painful exercise of thought as reading one of Mr. Dickens's stories. But here you talk to us about work and drudgery. Have we not enough of it during the day, without giving our evenings to it likewise? Why should we undergo all this labour? Why should we face this heavy work? I will tell you the reason why. Because it is your duty to yourselves, to those who are dependent upon you and look up to you. Because it is your duty to Him who has endowed you with the faculties and capacities you possess; who in bestowing them upon you, manifestly intended that they should not remain idle, nor continue stagnant or undeveloped. You have encouragements which those who went before you never had, or hoped to see. Some fifty years ago had young men attempted to improve themselves as you do now, they would have been looked upon with suspicion and dislike as discontented men, or even as disaffected persons, who were not satisfied with the station in which the Almighty had placed them, but forgetting the humility belonging to their condition were striving to raise themselves out of their proper class, their reprovers at the same time forgetting that they were themselves doing the very same thing, using up every energy of mind and body in a like pursuit, but of rank, decorations, or titles. You know how men in your own class, who formerly pursued knowledge under difficulties, were forced to read in the hours filched from the scanty time allowed for sleep; how they were compelled to beg or borrow old books here and there; how nobody, or at least only those very near and dear, felt any sympathy with their pursuits; how they received no word of encouragement, nobody to bid them God speed, how often the rare knowledge thus laboriously and painfully acquired at last died with them, for the opportunity to use it never came. They laboured without hope. Let not your labours then fall short of theirs. Such were the difficulties that men like Watt and Arkwright, and Brindley and Gifford, and Locke and Chantry, and a thousand others had to contend with. You have not fallen on their evil days. You live when public meetings such as this are held to give you encouragement by their sympathy, and help by their liberality, to urge you on to the work of improving and bettering yourselves. Money is subscribed for prizes to reward your diligence. Nearly 500 employers of labour have voluntarily taken on themselves the moral obligation to recognise the claims to employment of those who shall obtain the Society of Arts certificate. Men, some of them of the very highest eminence and acknowledged ability in literature and science, take on themselves the laborious and unpaid office of examining and classing those young men who shall come up to our Examinations. And now, let me tell you, that, so convinced are the Examiners of the Society of Arts of the greater value of accurate knowledge in a few things over a smattering in many, they have resolved to examine no candidate in more than three subjects. They desire to discourage the habit, now so common, of resting on a loose washy kind of information, which tends rather to mislead than to instruct. If a man is completely ignorant of any subject, he listens with respect and deference to him who is reputed a master in it, but immediately he acquires a smattering knowledge, he claims an Englishman's right to exercise his private judgment. Thus, beginners in Euclid, when, having been shown how to bisect an angle, they are told that the greatest mathematicians since the time of Archimedes have entirely failed to trisect it geometrically, immediately apply themselves with much dilligence to solve the difficulty which had baffled the genius of Newton. Beginners in any subject are apt to underrate the difficulties inherent in it. The more they learn, the more it grows upon them, the more its range seems to widen. A man taking up a new subject is somewhat like a squatter in one of the primeval American forests. When he begins to clear, he sees only a few trees about him, but as he proceeds with his work, the wider the range becomes, and the more numerous the trees appear. No man has ever yet completely exhausted any subject.

And, now, let me give you another piece of advice which you may find of use. Those Examiners I speak of, who are themselves so eminent in different specialities, have unanimously come to the determination to award neither prize nor certificate to any candidate, however profound he may assert his knowledge of any subject to be, unless he can show that he writes a good legible hand, spells correctly, and knows familiarly the common rules of arithmetic. But you will say this is vulgar knowledge, fit only for school-boys to be examined in. However that may be, the Examiners of the Society of Arts believe, and I entirely concur in the opinion, that no knowledge can be thoroughly comprehended that is not based on sound elementary principles.

In June next we shall hold Examinations at the Society's house in the Adelphi, and also at Huddersfield, for the Yorkshire Union of Mechanics' Institutions, numbering some 150 in number, of which Union Mr. Edward Baines, the indefatigable promoter of voluntary education, is the president. Next year we hope to widen the sphere of the Society's operations, so as to embrace Bristol, Birmingham, Liverpool, and the Eastern Counties. We trust that the strict adherence to truth, and the rigid impartiality with which we propose to issue our certificates, will obtain for them such an amount of public confidence, as will supersede the necessity of any further inquiry into the intellectual qualifications of the candidate. There will then only remain the moral character to inquire into, which I have little doubt will, in the vast majority of cases, prove satisfactory.

It has often been asserted—not so frequently perhaps of late years, that knowledge tends to puff up its possessor, and to make him over-much dissatisfied with his condition. Now, this objection holds good only when learning is very partially diffused throughout the community. In a country village, among unlettered rustics, the feeling is very natural with regard to anyone who is raised above them by knowledge, however superficial.

> "And still the wonder grew,
> How one small head could carry all he knew."

The Spanish proverb says—

> "In the country of the blind men a one-eyed man is a king."

Hence it is that we do not find a common stoker on a locomotive, or an artisan employed about the electric wire, puffed up with their knowledge, although either of them may possess such an amount of special information as, fifty years ago, would have immortalised half-a-dozen philosophers. And why is this? Because they see every stoker or like mechanic knows just as much as themselves. It is, therefore, the rarity of knowledge that puffs up its possessor. A fine voice often renders a singer vain, but if fine voices were as common as the gift of speech, nobody would be vain of his vocal powers. Were a man to walk about on stilts he would render himself very remarkable, but if everybody was to walk about on stilts, as they do in the *Landes* in the south of France, the singularity would disappear. So if only one or a few men are educated in a community they become conspicuous; if everybody is educated education ceases to be remarkable. The remedy, then, for conceit, is to diffuse education as widely as possible.

Young men, you have a wide and a fine field before you. The learned professions have long been open. Guilds of trade have fallen into disuse. What are called guilds in the City are associations of men who meet together for a very different purpose from that of upholding monopolies. Protection in trade and commerce has been abandoned. The civil service appointments throughout the vast continent of India are by law thrown open to the most unrestricted competition. The same may be said of the Engineers and Artillery. The Customs and Excise are sure to follow. It is only within the last two days that the Council of the Society of Arts have received a communication from the Privy Council Office, requesting the Council to nominate some of the candidates who had distinguished themselves at the Society's Examinations last June in the Adelphi, to compete for Junior Clerkships in the Treasury. The Council will, I believe, gladly comply with this request. When nearly ten years ago I published a pamphlet on this question, in which I advocated as a means of promoting national education, the throwing open of government appointments to public competition, I little expected ever to see my views realized, and my suggestions adopted. I trust the time is not far distant when the right or the privilege to enter into the service of the state shall be determined by competitive examination. Details may be cavilled at, plausible objections may be taken to the principle—just as plausible objections may be taken to every principle that could possibly be enunciated. I really can see no reason why it should not be as competent for a man to read up for an appointment in the Treasury or Foreign-office as it is to read for a fellowship in a college. Public appointments, as they are a charge upon the nation, should be the property of the nation at large, not the perquisites of a few. If the chief officers of state are not sufficiently remunerated for their services let their salaries be increased.

You have, indeed, young men of England, a glorious future before you, if you will only render yourselves worthy of the prize which is placed within your view. Not only this fair realm of England, but all its vast colonies and foreign possessions are your inheritance. Strive to make yourselves worthy of that country and that constitution which has now sanctioned the motto, *detur digniori.*

Perhaps it may not be out of place if, in the heart of this great city, the metropolis of England, and, therefore, the metropolis of the world, I say a few words on certain aspects of education which are not often adverted to, but which are notwithstanding worthy of your serious consideration. When you offer facilities such as these to every man in the community, when you throw open every office in the state to well-directed talent, continuous perseverance, and high integrity, what follows? Why, you cut up sedition by the roots. Aspiring and ambitious men have no longer any ground of complaint against the institutions of their country. If it be as open to A to rise by his talents, his industry, and his integrity as it is to B, then A, however he may lament his own failure, and complain of "circumstances over which he had no control," as the phrase goes, cannot complain of the law which afforded him as good a chance as it did to B. And is not this view borne out by facts? Has not sedition actually died out amongst us?

Contrast the state of this country now with that of forty years ago. Where are the Burdetts, the Cobbetts, and the Hunts, of radical celebrity? Contrast our social position with that of Naples, Austria, Germany, or Russia. Therefore to throw open to the widest competition all employments of honour and emolument is the true conservative principle of society, because everybody in the community endowed with natural power is interested in maintaining it. How much better and safer is it that men should labour to raise themselves to the level of those above them, rather than strive to drag down their superiors to their own level. Is it not a wise and conservative policy that promotion in the state should be sought by science rather than sedition, by competition rather than conspiracy. That men should endeavour to pass muster at the gate, rather than clamber surreptitiously over the wall.

But now some of you who hear me may raise this objection. All who work, all who read ,cannot be successful; some must fail. All cannot secure prizes; we cannot all be first in the race. There is no value whatever in this objection. Do not men crowd into business, open shops, take warehouses, invest all their capital; and this with the broad fact staring them in the face that men do fail in business, lose all their capital, become bankrupt, and throw away their labour apparently in vain. Yet men are not thereby deterred. Why should they? Life is but a succession of probabilities, and it is our part to turn them into certainties. We are surrounded by difficulties that we may strengthen our habits of patient endurance by overcoming them—

> "Out of this nettle danger we pluck this flower safety."

That man is scarcely to be envied who has never met with a difficulty nor resigned himself to a disappointment:—let me not trespass further on your attention, but bring these lengthened observations to a close by saying that idleness and ignorance are so costly that we cannot continue to pay for them. Just consider the annual amount of our national poor rates. Are they expended on the well-taught artizan or the industrious mechanic? Are not your paupers notoriously the handless, the headless, and the thriftless? If by some miraculous interposition they could be transformed into moral and industrious workmen, what an accession to the wealth and well-being of the country. Yet 99 in the 100 of those paupers might have been trained to this. Again, take our convict population, our ticket-of-leave system, our swindlers, garotters, and bullion robbers. Does not crime prevail in this country to an extent elsewhere unknown. With all our wealth and wide dominion, all our religion and civilisation, all our science and art, all our victories and triumphs, this is our vulnerable point. When a Roman General rode in triumph to the Capitol, he was obliged to take a slave with him in his triumphal car to remind him of the weakness of humanity and the degradation to which man might descend. In Britannia's triumphal procession to commemorate a long list of victories achieved, she too might take her ticket-of-leave man in her car. Let us, then, set our house in order; there is a lull at present in the political horizon. Now is the time to strengthen its walls and to repair its bulwarks. We cannot afford to waste our population. We are too few in number for the gigantic work we have undertaken, even if every man in the kingdom, rich and poor, were fully developed. Meetings are held, speeches made, societies formed, money subscribed, and rewards offered for improving the stock of our domestic animals; but man is looked upon too often as one of those worthless animals beneath our care. Whether man physically deteriorates or not we give ourselves but little concern. Yet it is a subject worthy of our most serious consideration, when we know that to crowd men into vast, overgrown cities, to shut them up in huge mills, factories, and workshops, breathing cotton-flue, and pernicious fumes and deleterious gases, has a tendency not only to shorten life, but to embody it, while it does last, in a feeble, ricketty frame. This is too wide and too serious a subject to be treated of at the close of a lecture. For conquest and for victory have we not done enough? We can well afford to put up with the petty insults of petty princes. Let us rather direct our thoughts to moral and social improvements at home. Abroad let us consolidate and Christianise; although our path might hitherto have been tracked by blood and human suffering, unavoidable, perhaps, let us now exhibit power, not under the aspects of rapacity and cruelty, as it ever has been exhibited by Europeans to the subject nations and tribes of the East, but rather under those of justice and benevolence, announcing the glad tidings of the Gospel, accompanied by the civilising influences of industry and education. Let us remember, that no record exists of any nation kindling for itself the flame of civilisation; it has always, to use the fine image of Plato, received the lighted torch from the hands of others. To civilse and Christianise the world we firmly believe to be our destiny. To accomplish this destiny, we shall need all those aids which the discoveries of modern science have placed within our reach, all that force of cultivated intellect which education in its most perfect form can bestow; all that perseverance and indomitable energy which moral training founded upon religion can alone create, to bear us victorious through the mighty conflict in which we are engaged, not the less momentous because it is peaceful. We know of no instance in which commerce has revisited the shores which she has once forsaken. The sun will not bathe, in the varied tints and hues of the evening, those slopes which he gladdened with the rays of the morning. The "shadow which has gone down on the dial will not go backward" to prolong the day of prosperity for a nation whose light is waning and whose glories are departing. Men who can discern the signs of the times look out with fear and anxious misgivings at the gloomy prospect which seems to deepen and to darken abroad. They see the palpable signs of regression, they mark a halt in the onward progress of mankind. They remember that the march of civilisation has more than once been stayed and turned back. Let us, too, humbly hope that we shall not be fated to afford another verification of the maxim of the historian, "that all empires, having attained to eminence, decay." Be it our glorious destiny to spread the blessings of civilisation—the fruits of a regenerated humanity—to give light to them that sit in darkness, to guide their feet into the way of peace.

Home Correspondence.

UTILISATION OF SEWAGE.

Sir,—Having seen the published paper read by Mr. W. F. Cooke, "On the Utilisation of the Sewage of Towns, &c.," together with the interesting discussion which followed the lecture, I am much pleased to find my opinions and published statements confirmed, by expressed opinions of eminent chemists and practical men, "that the treatment of liquid sewage by lime precipitation is not the proper mode," which should be "that which will fix the ammonia, and increase the fertilising power of sewage, either in a liquid or solid state."

But it is also apparent to me, that the solid residuum of Leicester sewage, amounting to barely two pounds extracted from one ton of sewage water (or about six thousand tons of solid from seven and a quarter million tons of sewage), as quoted, shows a misapplication of the powerful and beautiful machinery employed, there being not enough deodorising material introduced, supposing even that lime was the right sort.

It would appear, by the statement made, that the proportion of lime introduced into the sewage waters was, and is also proposed to be, one ton of lime to 14,000 tons of sewage water, by the calculations I have made. No wonder, with such a small dose as one to fourteen thousand, that the residuum is so small, especially when it is known that one pound of lime dissolved in 100 pounds (or ten gallons) of water is almost lost to sight.

But the fact of most importance is, "that the ammonia of the sewage—the real guano of it—is by lime precipitation disseminated in the liquid, and not driven into or incorporated with the solid residuum, which is the point of requirement," for it is certain "that however valuable and desirable liquid sewage may be as an irrigator, for showering our lands and crops, still it cannot be stored or retained more than a day or two at the furthest, whilst the solid residuum of sewage, if the ammonia is fixed in it by proper chemicals, will bear drying, storing, packing, and carriage all over England, for any reasonable length of time; and when used, can even then be crushed or powdered, and water or fresh sewer water be added to it, so as to apply it in the liquid form. This I firmly believe to be the rational view of the question, and I trust this may appear so to others as well as myself. I had much gratification in reading an article from the *Observer*, announcing that a commission was about to be formed for inquiring and determining the best and surest mode of deodorising, disinfecting, and utilising effectually the sewage of towns, and for preventing towns, cities, &c., from polluting the rivers and streams near them. This, if carried out by clever scientific practical chemists and sound practical agriculturists, united in a committee of investigation, and fair trial, without favour or prejudice, afforded to all competitors, will result in immense benefits to the community generally.

An extensive range is open, and I believe the calculation made in the *Engineer* leading article of 28th Nov. is not in excess when it states "the value of the sewage of England to be thirty million sterling per annum," all now wasting, and diffusing every species of disease and social evils around, for want of determination, decision, and real action, instead of the mere talking about it, and continually postponing the carrying out of the remedies until a more convenient season; and so these evils are, as it were, fostered and cherished, and disease, misery, and squalid vice propagated, the constant attendants of accumulating filth.

Trusting some abler advocacy than mine will follow up these observations, which are offered with the sole object of doing good, I am, &c.,

W. AUSTIN.

10, Upper Portland-place,
Wandsworth-road.

Proceedings of Institutions.

Crosby-hall Evening Classes.—The Lent term was inaugurated on Tuesday the 13th inst. by a brilliant and instructive lecture by Professor Levi, being the first of a course on the "History and Principles of Banking and Commerce." The chair was taken by the Right Hon. the Lord Mayor, and amongst the gentlemen present were, Mr. Sheriff Mechi, the Revs. Charles M'Kenzie, Richard Whittington, M. W. Lusignan, and W. H. Dickison; Messrs. J. W. Gilbart and Metcalf Hopgood. The lecturer, after commenting on the importance of the subject and its interest to all classes of the community, observed that the transition from the savage state to the pastoral, and from the pastoral to the agricultural, in which men first begin to take refuge in hamlets, and then, in forming towns, prepare for the next change to the commercial, has never been sudden nor violent. In the history of commerce there were numerous and striking episodes. During the earlier period it had been paralysed by erroneous notions of geography, and ignorance of navigation—brigandage on land, and piracy on the seas—by the want of roads and mercantile institutions—by the small number of articles of commerce—the limited amount of produce, and the want of sufficient markets. But, notwithstanding all these difficulties, it was during this period that the Tyrians became distinguished as merchant princes—the Greeks first founded colonies—the Carthaginians traded to Britain—the Romans by their great judicial acumen greatly enriched mercantile jurisprudence—at Venice public banks were first established. The lecturer described the conditions which encouraged the Spaniards and Portuguese in the pursuit of discovery to which they were urged on by religious zeal, the desire of wealth, and of extension of powers. He then went over the history of Columbus's struggles to overcome the prejudice of the age, and his ultimate appeal to Ferdinand and Isabella for countenance and assistance, and gave an interesting description of his discovery of America, after overcoming all these obstacles, and then proceeded to the doubling of the Cape soon after, by Vasco de Gama. He dwelt on the magnificent prospect that now appeared to open before the Spaniards and Portuguese, with all the wealth of India and America apparently at their disposal, but which prospects were never realised. He spoke of the rise of Holland as a commercial state, and described how England at last manifested her powers, and began to assume the importance which had increased till she gained her present proud pre-eminence. He then gave some comparative statistics showing the immense increase of commerce in the present as compared to former ages. He referred to various inventions and improvements in locomotives, navigation, arts, science, and manufactures, from the time of Columbus to the present day, and to the still greater extension of commerce that might be expected from further improvements in art and science, and from the discovering of new and productive districts. He here paid a tribute to Dr. Livingston, whose recent discoveries opened a new field of enterprise. A new district would be brought into cultivation sufficient to grow corn enough to supply the British empire. In reference to the late commercial frauds, he contended that they did not show a falling off of commercial morality in general; but that the universal reprobation with which they were received was the best proof of the soundness of public feeling and the healthiness of the general tone. A vote of thanks to the lecturer was proposed by the Right Hon. the Lord Mayor, seconded by Mr. Gilbart, and carried unanimously.

SOUTHWARK.—The Literary and Scientific Institution have engaged Professor Levi to deliver four lectures, "On the History and Principles of Banking and Commerce" on the four following Fridays:—Jan. 23rd and 30th, Feb. 6th and 13th.

MEETINGS FOR THE ENSUING WEEK.

MON. Actuaries, 7.
London Inst., 7. Mr. Charles Salaman, "On the History of Music, especially in connection with National Dances."
Architects, 8.
Entomological, 8. Anniversary.
Geographical, 8½. I. Capt. Yule "On the Geography of Burma, with a new map of the same." II. Messrs. H. and R. Schlagentweit, "Journey across the Kuenluen from Ladak to Khotah." III. Lieut.-Col. J. Smyth O'Connor, "Trinidad and the Orinoco."
TUES. Royal Inst., 3. Prof. Huxley "On the Senses of Smell and Taste."
Meteorological, 7. I. Mr. James Glaisher, "On the determination of the Mean Temperature of every day, as deduced from the observations taken at the Royal Observatory, Greenwich, during the 43 years ending 1856." II. Mr. J. Radcliffe, "Meteorological Observations taken at Sinope."
Civil Engineers, 8. Renewed Discussion on Mr. Window's paper "On Submarine Electric Telegraphs."
Med. and Chirurg., 8½.
Zoological, 9.
WED. London Institution, 3. Mr. E. W. Brayley, "On Mineralogy and Crystallography."
Society of Arts, 8. Mr. John Anderson, "On the Application of Machinery in the War Department."
Archæological Association, 8½.
THURS. Royal Institution, 3. Prof. Tyndall, "On Sound."
Royal Society Club, 6.
London Institution, 7. Dr. R. E. Grant, "On the Natural History of Extinct Animals."
Antiquaries, 8.
Royal, 8½.
FRI. Royal Institution, 8½. Rev. Frederick D. Maurice, "Milton Considered as a Schoolmaster."
SAT. London Institution, 3. Mr. T. A. Malone, "On Experimental Physics, chiefly in Relation to Chemistry."
Royal Institution, 3. Prof. Phillips "On the Mean Level of the Sea—its Possible Variation from Probable Causes."
Medical, 8.

To Correspondents.

ERRATA.—In the last number of the *Journal*, page 113, col. 1, line 42, for "Keppell," read "Heppell;" and page 128, col. 1, line 39, for "*seccuderes*," read "*scandens*."

PATENT LAW AMENDMENT ACT.

APPLICATIONS FOR PATENTS AND PROTECTION ALLOWED.

[*From Gazette, January* 16*th*, 1857.]

Dated 11*th September*, 1856.

2128. John Talbot Pitman, No. 67, Gracechurch-street—Improvements in the construction of iron bridges. (A communication.)

Dated 9*th December*, 1856.

2918. Anne Marie Macé, widow of Georges Fremont, Rue des Colonnes, No. 4, Paris—A new manure for preventing the vine and other diseases arising from the soil, and from other similar purposes.

Dated 24*th December*, 1856.

3057. Richard Archibald Brooman, 166, Fleet-street—Improvements in treating pile and cut pile fabrics, and in the manufacture of certain new pile fabrics. (A communication.)
3059. Cromwell Fleetwood Varley, 2, Gloucester-terrace, St. Paul's-road, Islington—Improvements in electric telegraphs.

Dated 30*th December*, 1856.

3091. William Armand Gilbee, 4, South-street, Finsbury—Improvements in treating beet-root for the manufacture of vinegar. (A communication.)
3093. William Edward Newton, 66, Chancery-lane—Improved means of preventing the explosion of steam boilers. (A communication.)
3095. Richard Archibald Brooman, 166, Fleet-street—Improvements in lifting jacks. (A communication.)
3097. Richard Archibald Brooman, 166, Fleet-street—Improvements in manufacturing articles of earthenware and other ceramic materials, and in the machinery and apparatus employed therein. (A communication.)
3099. Joseph Lane, Manchester—Certain improvements in Jacquard looms. (A communication.)

Dated 31*st December*, 1856.

3101. Peter Madden, 20, Half Moon-street, Piccadilly—Improvements in furnaces or fireplaces applicable to such in use for either heating of drying-kilns, roasting of substances, or heating of boilers.
3103. Charles Wye Williams, Liverpool—Improvements in apparatus for mechanically charging furnaces with fuel.
3105. William McCulloch and Thomas Kennedy, Kilmarnock, Ayr, N.B.—Improvements in stop-cocks or valves.

Dated 1*st January*, 1857.

1. John Talbot Pitman, 67, Gracechurch-street—A machine for making carpet lining and other similar articles. (A communication.)
2. Charles Christian Reinhardt, Baltimore, U.S.—An improvement in the manner of fastening metallic backs to truss pads of glass, porcelain, or other analagous substances.
3. William Rigby, Salford, near Manchester—Improvements in machinery or apparatus for engraving metallic cylinders or rollers employed for printing calico and other substances.
4. John Bourne, 9, Billiter-street, London—An improved steam train for navigating shallow rivers.
5. Eugène Theodore Noualhier and Jean Baptiste Prévost, Paris—Improvements in applying metals over hard vitrified or any other surfaces by galvanoplastic process.
6. Joseph Smith, Great Bridgewater-street, and Horatio Wiseman, Great Ancoats-street, Manchester—Improvements in shutters for shop fronts, and in apparatus connected therewith.
7. Frederick Herbert Maberly, Stowmarket, Suffolk—Improvements in the construction of wheeled carriages.
8. Frederick Ayckbourn, 4, Lyon's-inn, Strand—Improvements in stockings for personal wear.
9. Frederic Sarley Stott, Bradford—Improvements in slide valves applicable to steam and other motive power engines.
10. Anthony Lorimier, Bedford-square East, Commercial-road—An improvement in preparing the surfaces of printers' inking rollers and other articles when vulcanized india-rubber is used.
11. William Henry Phillips, 16, Essex-street, Strand—Improvements on stereoscopes.
12. John Fowler, junr., Havering, near Romford—Improvements in giving motion to ploughs and other agricultural implements.
13. William Lawrance, Chelsea—An improved chimney cap or cowl and ventilator.
14. Edouard Vincent Jules Laurent Georges, Paris—Improvements in preparing animal substances for food.
15. Joseph House, Minories, London—Improvements in concentrating and preserving milk and other liquid articles of food.

Dated 2*nd January*, 1857.

16. John McLennan, 6, Park-place, Highbury, Islington, John Palmer, and John Henry Palmer, 60, Mildway street, Stoke Newington—An economical gas light generator and consumer.

18. John Pettigrew, Glasgow—Improvements in the manufacture of bread.

19. John Henry Johnson, 47, Lincoln's-inn-fields—Improvements in apparatus for roasting meat. (A communication.)

20. John Henry Johnson, 47, Lincoln's-inn-fields—Improvements in pressure guages. (A communication.)

21. Augustin Gras, Marseilles—Improvements in obtaining motive-power.

22. John Baird, Govan, near Glasgow—Improvements in planting potatoes.

23. Nicolaus Charles Szerelmey, 5, Bermuda-place, Bath-road, Queen's-road, Peckham—Improvements in preparing combinations of materials for rendering walls and other structures waterproof.

24. Joseph Turner, King's Lynn, Norfolk—Improvements in oscillating cylinder steam engines.

25. James Harris, Hanwell, Middlesex—Improvements in obtaining and transmitting motive power.

26. Richard Archibald Brooman, 166, Fleet street—Certain improvements in rotary steam engines. (A communication.)

27. Richard Archibald Brooman, 166, Fleet-street—An improved steam engine. (A communication.)

Dated 3rd *January*, 1857.

28. Leonard William Watkins, 77, Charlotte-terrace, New Cut, Lambeth—The manufacture of a composition, commonly known as putty, to be used in glazing and other purposes.

29. Francesco Ferro, 2, Hatton-garden, London—The manufacture of paper from a vegetable or herb that grows in the isle of Sardinia and Spain, and which he proposes to call Ferus paper.

30. William Edward Newton, 66, Chancery-lane—Certain improvements in the means of connecting, accumulating, retaining, and applying reserved power for the application of railway brakes in sudden emergencies. (A communication.)

31. Alexander Angus Croll, Harold's Wood Lodge, near Romford, Essex—Improvements in the manufacture of coal gas.

32. Richard Archibald Brooman, 166, Fleet-street—Improvements in winding, twisting, and doubling fibrous materials in the machinery employed therein, and in the mode of driving the same, parts of which improvements are applicable to the communicating of rotary motion to other machinery. (A communication.)

33. Christopher Binks, London—Improvements in treating ore in the manufacture of iron, and in obtaining products therefrom.

34. Christopher Binks, London—Improvements in obtaining certain compounds of cyanogen.

Dated 5th January, 1857.

35. Thomas Forsyth, Manchester—Improvements in locomotive and other steam engines.

36. John Ingham and Edward Ingham, Bradford, and Benjamin Ingham, Halifax—Improvements in apparatus employed in finishing textile fabrics.

37. Andrew Brundish, Birmingham—Improvements in mounting knobs, and in constructing and mounting roses for locks, latches, and other such like fastenings.

39. Frederick Braithwaite, 32, Gower-street, Bedford-square—An improved mode of extracting the iron from tin ores.

40. David Baker, Gisbro' Alum Works, Yorkshire—An improvement in the manufacture of paper.

41. William Gossage, Widnes, Lancashire—Improvements in the manufacture of sulphuric acid, and in the construction of apparatus used for such manufacture.

42. John Oldham, Preston, Lancashire—An apparatus for closing the supply cocks of gas burners.

43. John Moore Hyde, Cumberland Iron Works, Bristol—Improvements in iron and wooden ships or vessels, and in the adaptation of the machinery for propelling the same.

Dated 6th January, 1857.

44. François Frederic Dumarchey, Samuel Levy, and Joseph Mayer, Paris—Improvements in wheels and axles for common road carriages.

45. Thomas William Kennard, Sussex-gardens, Hyde-park—Improvements in metallic piles.

46. Thomas Holmes, Pendleton, Lancashire—Improvements in the prevention or consumption of smoke in furnaces and fire-places.

47. Louis Antoine Ritterbandt, M.D., 45, Warwick-street, Regent-street—Improvements in the treatment of substances containing earthy phosphates.

48. Julius Decimus Tripe, King's-place, Commercial-road—Improvements in mechanism for affording increased security to valves, taps, or other apparatus used for regulating or interrupting the flow of gases, vapours, and liquids.

49. Frederick Herbert Maberly, Stowmarket—Improvements in constructing receptacles for sewerage, for separating the fluid from the solid portion thereof, and for purifying, storing, and carrying away the same.

50. Henry Bougleux, Leghorn—Improvements in steam boilers.

52. Richard Archibald Brooman, 166, Fleet-street—Improvements in knitting frames. (A communication.)

53. Alexander Arthur Dunbar, Glasgow—Improvements in lifting, lowering, and disengaging ships' boats.

54. Matthew Trattles, Staithes, Inderwill, Yorkshire—Improvements in tools for cutting cylindrical and conical forms.

55. Charles Cook, 76, Mount-street, Grosvenor-square—Improvements in apparatus for generating draughts in chimnies and for other purposes.

Dated 7th January, 1857.

56. Benjamin Hargreaves, Habergham Eaves, near Burnley, Lancashire, and Abraham Mosedale, Burnley—Certain improvements in looms for weaving.

INVENTION WITH COMPLETE SPECIFICATION FILED.

106. Walter Thurtell, jun., Wells, Norfolk—Manufacturing cases of deposit for adhesive stamps, labels, or papers, so arranged, that such adhesive papers are moistened and kept in a moistened state distinct and separate.—13th January, 1857.

WEEKLY LIST OF PATENTS SEALED.

January 14th.

1654. Charles Burrell.
1660. William Clibran and Joseph Clibran.
1661. William Watt.
1673. Richard Morgan.
1674. Thomas Duncan.
1690. William Leuchars.
1692. George Frederick Hipkins and John Britten.
1720. Robert Richardson, and Jonathan Edwin Billups.
1732. Charles Cowper.
1746. Giles Mabie.
1761. Joshua Mather and William Forshaw.
1762. Richard Archibald Brooman.
1779. Richard Clarke Pauling.
1782. George Colleton Cooke.
1800. Henri Evette.
1811. Richard Archibald Brooman.
1812. Richard Archibald Brooman.
1942. Anthony Charles Vetter de Doggenfeld.
2545. Peter Fairbairn and Robert Newton.
2567. John Young.

January 16th.

1675. David Bowlas.
1706. John Whitehouse.
1708. William Astbury Jump.
1709. John Smith and E. Harrison.
1715. Elias Leak.
1718. John Pursloe Fisher.
1724. William Green.
1734. Henry Hindle.
1749. John Derbyshire.
1804. Joseph Hopwood.
1805. George Holcroft and Peter Johnson.
1813. Pierre Marie Joseph Chamblant.
1822. John Avery.
1824. Richard Albert Tilghman.
1825. Robert Reeves.
1828. Richard Archibald Brooman.
1829. Thomas Donkin.
1830. Josiah Rhodes.
1840. Henry Walker Wood.
1944. John Henry Johnson.
1967. John Henry Johnson.
2015. John Henry Jonnson.
2501. Robert Struthers.
2539. Thomas Clutton Salt.
2703. Robert Mushet.
2748. Thomas Francis Joyce.
2773. Edward Tucker.

January 20th.

1716. Marc Antoine Augustin Gaudin, and Eugene Xavier Choumara.
1717. Francis Barbour.
1719. James Clark.
1722. Frederick Simpson.
1723. Maurice Vergnes.
1737. James Clark.
1739. George North.
1759. George Alexander Copeland.
1760. Charles Tiot Judkins.
1780. James Dickinson.
1835. Charles Theodule Launay and Jules Chopin.
2399. John Stephen.
2404. Thomas Stokes Cressey.
2439. Frederick Arthur Magnay and Ralph Radcliffe Whitehead.
2589. Samuel Cotton.
2722. Frederick Arthur Magnay.

Patents on which the Third Year's Stamp Duty has been Paid.

January 13th.

180. William Massey.

January 14th.

98. James Newall.

January 16th.

111. Henry Corlett.
113. Bevan George Sloper.
115. Edward Lord.
121. Edmund Sharpe.
135. Charles William Rowley Rickard.

January 17th.

126. George Henry Bursill.
129. John Norton.

WEEKLY LIST OF DESIGNS FOR ARTICLES OF UTILITY REGISTERED.

No. in the Register.	Date of Registration.	Title.	Proprietors' Name.	Address.
3930	Jan. 15.	Fastening	Wm. Rawlings........................	Gloucester.
3931	„ 16.	Fastening for Doors of Lamps	Edward Howes........................	Birmingham.
3932	„ 17.	Chaff-cutting Machine.....................	John Mansfield........................	Harleythorn, Staffordshire.
3933	„ 17.	Screw Wrench................................	Palmer and Sons.....................	Back Lines, near Birmingham.
3934	„ 20.	Iron Boot Heel	Martin Richard Ashwin	Birmingham and Edgbaston.
3935	„ 21.	Fastening for Corsets and Stays.	Thomas Todd	Edinburgh.
3936	„ „	Improved Buckle	Wm. Aston	Birmingham.
3937	„ „	United Service Collar.......................	Dent, Allcroft, and Co.............	97, Wood-street, Cheapside.

Journal of the Society of Arts.

FRIDAY, JANUARY 30, 1857.

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CONVERSAZIONI.

The Council have arranged for two Conversazioni for the Members of the Society and their friends, the first to take place on Saturday, the 21st of February, to which ladies will be invited; the second on Wednesday, the 6th of May, to which gentlemen only will be invited.

NINTH ANNUAL EXHIBITION OF INVENTIONS.

The Council have fixed Monday, the 23rd of March next, for the opening of the Ninth Annual Exhibition of Recent Inventions.

Persons intending to contribute to the Exhibition should communicate with the Secretary forthwith, stating—

1. The title of the invention.
2. Whether the article will be a specimen, model, or drawing.

Articles for exhibition must be forwarded to the House of the Society, *carriage paid*. The days for receiving articles are, Thursday, the 5th, Friday, the 6th, and Saturday, the 7th of March.

All articles should be accompanied with a short description of the invention, for the Catalogue, with a wood-block (when possible), and a reference to any publication where a fuller account may be found.

EIGHTH ORDINARY MEETING.

Wednesday, Jan. 28, 1857.

The Eighth Ordinary Meeting of the One Hundred and Third Session was held on Wednesday, the 28th inst., W. G. Armstrong, Esq., in the chair.

The following Candidates were balloted for, and duly elected members of the Society:—

Beverley, Henry Webber.
Dilke, Charles W., jun.
Graham, Forster.
Gyde, Alfred.
Harvey, James.
Hilton, Thomas.
Humphreys, Edward Rupert, LL.D.
Jaffray, Arthur Woodriff.
Kimber, Thomas.
Laurence, George.
Lewis, Harvey.
Lynd, William.
Pakington, Rt. Hon. Sir John S., M.P., D.C.L., &c.
Phillipps, William.
Pyper, Rev. Richard.
Ryland, Arthur.
Smith, Henry Fry, B.A.
Thrupp, George A.
Trevelyan, Alfred Wilson, A.B.
Webb, John.
Yelland, Robert Easton.

The Paper read was:—

ON THE APPLICATION OF MACHINERY IN THE WAR DEPARTMENT.

By John Anderson, Inspector of Machinery, Royal Arsenal, Woolwich.

During the last few years important improvements have been made in the manufactories of the War Department. Up to a recent period, by far the greater proportion of the work, in making the munitions of war, was performed by hand labour. In 1842 there were but two steam-engines, together equal to 32 horse-power, which gave motion to a few machines for sawing and planing the timber of gun-carriages. The simple statement that there are now 68 steam-engines, with a nominal power equal to 1,170 horses, giving motion to 16,540 feet of shafting, 18 steam hammers, 64 hydraulic presses, and 2,773 machines of various descriptions, will afford some notion of the extraordinary effort which has been made to render the several establishments thoroughly efficient and fitted for any emergency.

These improvements embrace such a variety of detail that an extremely superficial view only can be given of them, in the short space of time which is allowed me, for I can only hint at great plants of machinery in general terms; but I trust, notwithstanding, to be able to show that the War Department has been thoroughly in earnest, and that the great aim has been to obtain the best apparatus that could be procured.

Without prejudice, the United States of America, the continent of Europe, and our own country, have been searched for the most superior appliances, and hundreds of machines have been designed for purposes peculiar to the War Department, but which may be usefully employed in the general manufactures of the kingdom.

From these important changes and improvements the greater proportion of war stores can now be produced with unskilled labour, the form, dimensions, quality, and quantity of the produce being mostly dependent on self-acting apparatus, a system of operation which has been more fully developed in the wood and metal manufactures of the War Department than in any private establishment with which I am acquainted.

From the completeness of the machinery, and the general arrangement of the plant, the cost of production of the several articles is reduced to a minimum, and there being no pecuniary interest calculated to induce an inordinate desire for saving, either in regard to the quality of the materials employed, or in the amount of workmanship necessary to be expended, there is great security afforded that the several articles are the very best for the purpose which can be made, a most vital consideration in regard to war stores and material, on which may some day depend the fate of battles and the nation's honour.

When the several works now in progress are completed, the Government will be placed in the commanding position of being able to provide the munitions of war, fresh and serviceable, in such abundant profusion as shall be equal to the sudden requirements of any armament they may deem necessary to equip.

Of the more important services to which machinery has been applied by the War Department, a few have been selected for enumeration; these have been chosen either for the extent of their application, or the interest which the meeting is likely to attach to the class of subject, commencing with

Small-Arms.

The small-arms manufacture of England, both in the public and private establishments of the country, has not kept pace with other branches of industry, in the application of labour-saving machinery. This has resulted from various causes, partly from the peculiar organisation of the system of hand labour, by which the various parts of the musket have been hitherto produced, thus rendering it difficult to apply machinery qualified to compete therewith, and which, at the same time would repay the necessary outlay.

The musket being an instrument of considerable refinement, requiring from those who make it a high degree of skill, and an extreme nicety of workmanship in many of its component parts, the obstacles in the way of applying the ordinary machinery of the machine maker are numerous; for although there may appear some resemblance between muskets and small machinery, yet, when compared minutely, the similarity soon vanishes. The forms employed by the machine maker have, with a few exceptions, been simplified into the line, the plane, the circle, the cone, and the sphere, all of which are very easily produced by simple apparatus. The parts of the musket, on the contrary, are of forms so various and nondescript as to call for another description of tools, involving a higher and more advanced state of the arts to insure its successful introduction. The parts of ordinary machinery, although accurate, as compared with the general work of carpenters, still come far short of the precision required in the fabrication of small arms, where the form and dimensions are determined to the thousandth part of an inch.

For the last hundred years, machines, such as the rose lathe, have been made to produce the most refined instruments, so accurate, indeed, that no hand labour could imitate them; but the work is performed so slowly as to render its produce far too costly for the workshop of the gunmaker, who requires a system of apparatus which shall afford the utmost exactness, fully equal to that of the philosophical instrument maker, but which, at the same time, will yield a rate of production equal to that of the more simple and less refined workmanship of the machine maker.

The difficulty of reconciling these two conditions, has hitherto been of so formidable a character, as to have offered a complete barrier to the extensive application of machinery in the manufacture of small arms.

Had the manfacture of muskets been carried on in the same manner as that of machinery, in factories where the several parts of stock, lock, barrel and bayonet, were made under one system of management, the general introduction of refined tools would have been sooner arrived at; but from the constitution of this branch of industry, with the separate parts produced by different masters, and then afterwards collected in the workshops of another master to be there put together, there is little difficulty in arriving at one cause of the limited application of machinery; and all the more so that the prejudices of those engaged in that mnufacture were naturally opposed to a system which put their old arrangements to one side, and which demanded a degree of refinement in tools and machinery not to be met with in any extensive manufacture in the kingdom.

Before a manufactory for small-arms could be satisfactorily organised, the world had to undergo a certain course of training. The inventions of Watt and Arkwright led to the manufacture of machinery on the largest scale, while the inventions of Bentham and Brunel contained almost all the esssential elements of modern tools, and more especially the germ of the application of machinery to copy intricate forms from a pattern; a principle of operation which has been most successfully developed in the new small-arms manufactory of the War Department.

Although the difficulty of introducing radical changes into the gun trade of the old world, where it has existed for centuries, and where there are obstacles of a traditional and local character to be overcome (besides the private interests with which they come into collision), are very great; still, it is not surprising that in a new country like the United States of America, where the price of labour was very high and ingenuity abundant, in establishing the manufacture of small-arms, they should pursue a different track (and all the more so when placed under the management of such an able machinist as the celebrated Whitney), in which the successful inventions and mechanical principles of other departments of art are assembled together, and specially adapted to the requirements of the musket or pistol manufacture, at the same time combining them with the true manufacturing principles which have been so eminently successful in other branches of industry.

There having been some difficulty experienced in obtaining the Minié rifle in 1853 and 1854, the government determined to erect a manufactory of small-arms which should combine all modern appliances for saving labour and for securing the most rigid accuracy of production. Accordingly such an establishment has been completed on a scale capable of producing about 1,000 muskets per week. It comprises about 150 horse-power, 3,000 feet of shafting in motion, and upwards of 1,000 machines, or apparatus, for the various purposes of the manufacture. Upwards of 200 of these machines have been brought from America, a few were obtained in Belgium, but by far the greater number, between eight and nine hundred, were made in England, and, in order to insure perfect success, the details are being carried out by an American gentleman, brought over by the government, who possesses a thorough and practical experience in the working of this system in the United States, and who has the assistance of several of his own countrymen, from the small-arms factories of New England.

The leading principle upon which this manufactory has been organised consists of an extreme subdivision of operations, to produce each of the separate parts composing a musket, in order that each operation or process may be in itself so simple, as that it may be performed by an unskilled individual, and at the same time may afford that rigid accuracy of form and dimensions which are essential to perfect fitting, and to ensure that amount of precision which will enable the parts of several muskets to interchange with each other. The operations performed by the several machines are so arranged consecutively, that the greater portion of the work is done, or material removed, by a preliminary class of machines, thus leaving to those that follow after comparatively little to do, merely to produce that degree of exactness which is absolutely essential.

In the Smithing Department, articles such as the bayonet, the several parts of the lock, the ramrod, and even the barrel, are produced by a system of copying either by the forging machine, by dies in the American drop hammer, by rolls containing the form required upon their surface, or by some other modification of that principle, in which the form of the article does not depend on the operator so much as on the apparatus. When forged, such articles as the bayonet and the parts of the lock, pass to an annealing department, where they are put into ovens to be softened; they then proceed onwards to the pickling branch, where, by means of acid, all the oxide or scale is removed and the pure metallic surface is laid bare; by this means the cutting instruments in the finishing department are preserved from the injury and blunting to which they would otherwise be exposed. In the machine or finishing room (which has an area of 40,000 square feet), where the several parts are cut to the proper dimensions, the tool or instrument which is principally employed in the machines for cutting metal articles is some modification of the circular cutters, technically termed "milling tools." These milling tools are made in every variety and form to produce the required shapes of the several articles, and they are mounted on adjustable spindles, the article to be cut being held in a peculiar vice or holder specially adapted to itself, and by a self-acting motion passing transversely against the revolving cutter, which is so arranged that when the operation is completed the machine stops of itself. When holes have to be drilled in an article, as in the lock plate, for example, it is enclosed in a perfectly fitting steel box, having a lid provided with holes corresponding with those required; the drilling machine contains a number of spindles, each carrying a drill of the required size, and running at the proper speed. These drills in succession are passed through the respective holes in the lid of the case, at the same time piercing the soft article which it contains; thus perfect identity and absolute accuracy are obtained; and as each machine is used for a single operation only, that operation is thereby rendered extremely simple, and requires but a small amount of care or skill in its performance.

The bayonet, from first to last, undergoes seventy-six operations, each of which is definite and simple, and at the conclusion of the last one, the several bayonets are as much alike as the different pieces of money from the Mint, and they present a degree of accuracy which could not be equalled, even at three times the cost, by the tools or apparatus which have hitherto been employed in England.

To secure such a degree of precision in an article which has to be made by the thousand, involves an entirely different system of manufacture to that pursued by the machinist or the engineer; to select a single illustration out of hundreds that might be named if time permitted—the formation of the hole through the bayonet socket, where it fits upon the end of the musket barrel. The solid iron socket, as it comes from the pickling room, is first put into a milling machine, where, by means of a pair of milling instruments, it is cut at the ends to within the fiftieth of an inch of the proper size; then, by a second machine, it is bored or drilled out roughly, and nearly to the correct dimensions; then, by a third machine, it is bored out still nearer and very carefully by a stationary instrument, with the socket revolving. It then proceeds to another description of machine, to have one end of the socket completed by a revolving tool, then to another similar machine to have the other end completed in the same manner. By a sixth machine the hole is slightly tapered; then, after a number of other operations have been performed on different parts of the bayonet, this hole is again entered by another tapering tool, making the hole within the thousandth part of an inch of the finished dimensions; and lastly, after the bayonet is all but completed, the hole receives the finishing touch. By this system the holes in the socket of each bayonet are perfectly alike, and as the instruments which perform the more delicate parts of the process have so little work to do, they continue for months without the smallest variation. A similar treatment is bestowed on every other part of the exterior of the bayonet socket, on its neck, on the blade and locking ring, also on every other metal part of the musket, but which to describe minutely at the present time would occupy too much space; yet such is the precision of this system on the several parts, that when completed with a small amount of hand finish and polishing, the several parts interchange, and may be selected at random from a heap, to be put together.

The gun stock is an article which, from the irregularity of its form, and the extreme degree of exactness required in those parts where it has to receive the lock, the barrel, and its other components, is obviously a most difficult thing to produce by machinery; this, however, has been done to the utmost degree of perfection. In its manufacture the stock has to pass through some twenty operations, all of which are on the copying principle, leaving only the polishing process to be performed by hand labour, the fitting of the lock, trigger guard, barrel, and all other nice parts being such as could only be equalled by the most careful workmen, no hand finishing being required, while the time occupied in performing the several operations is under half-an-hour, which includes the fixing and unfixing of the gun stock in the several machines.

The same system is pursued in the manufacture of the gun-barrels, and of all the other parts of the musket, but which, for want of time, cannot be described at present.

The Small-arms Manufactory is now all but completed, and the specimens of its produce, which have been selected at random, are laid on the table for examination. In an economic point of view, this establishment will well repay the outlay which has been incurred in its erection, but it will be found of still greater importance and value as an agent that will afford a higher standard of accuracy and refinement, that will secure that minute degree of precision by which the several parts of muskets may interchange; and if the military gunmakers of England are wise in their generation, they will not despise this system of manufacture, but, on the contrary, will adopt it, for it will secure for them a high vantage ground in competing with other parts of the world. Nor are the peculiar advantages of this system confined to that branch of trade alone, it is capable of extensive application in other manufactures; and the American machinery which has been introduced into England by the War Department is so peculiar, and different from that usually made in this country, that it presents a rich mine of mechanical notions, worthy of being studied by our machine makers. The gun-stock machinery, especially, is a positive addition to the mechanical resources of the nation.

An attentive examination will bear out this statement, and will show that our transatlantic competitors are not behind us in the race of machine-making; that they show an originality and a common-sense in many of their arrangements which are not to be despised, but, on the contrary, are either to be copied or improved upon; and, knowing all the circumstances, I consider that the Government of this country are justly entitled to a large share of credit for the determined perseverance with which they have carried out this great, but unpopular, undertaking, which, I am sure, will be fully appreciated by the nation, when its numerous advantages are properly understood.

Ammunition Stores.

During the latter part of the French war considerable life was infused into the construction of laboratory articles, but the method of producing them continued, with little alteration, until within the last few years. After this lapse of time it is difficult to account for indifference to such an important particular, seeing that the numerous inventions of Sir Samuel Bentham and others, which would have been so serviceable, were well known and made available in other departments of the service.

Between the years 1840 and 1853 a few machines were introduced into the manufacture of percussion caps, spherical bullets, and metal fuzes; but, upon the whole, there was comparatively little done to improve the system of production.

In 1853 the Government determined to erect suitable factories or workshops, which should embrace the leading principles of the best conducted manufactories, in which the raw material should enter at one side, and, by a gradual advance, arrive at the storehouse on the opposite side a finished article, and the machinery, as far as possible, should be self-acting. The instructions which were then given have been fully carried out, and to a much greater extent than at that time was anticipated.

Of the more important applications of machinery to manufacture this numerous class of articles, may be enumerated that for producing the ammunition for small arms, shells, fuzes, and war rockets.

The adoption of the Minié rifle having created a demand for the elongated bullet in large numbers, and of extreme accuracy in weight and dimensions, to meet these requirements a plant of apparatus has been provided, capable of producing 500 bullets per minute, or more than a quarter of a million daily. In this manufacture the lead is first put into a cylinder, from which it is squirted into a long rod by means of hydraulic pressure; the lead rod is then wound upon iron reels, which are transferred to the machinery for compressing the bullet. The bullet machines are entirely self-acting, and unwind the lead rod from the reels as they require it, first cutting off the required quantity, then compressing it into form, and then delivering the bullet ready for the cartridge.

For each cartridge a conical wooden plug, of peculiar form and exact dimensions, is required. These plugs are made by means of self-acting machinery, for which the wood is first cut up into long square rods by means of circular saws; one end of the rod is put into the iron hands of the machine from the extremity of which the plug is fashioned by a revolving cutter and then cut off by another instrument, and so on until the rod is used up, a boy being sufficient to attend upon several machines: the produce is equal to a quarter of a million daily.

Hitherto small arm cartridges have been made up with several pieces of paper that were rolled into the proper form, to hold the bullet, plug, and powder, an arrangement which has been found liable to some important objections. A few years ago, a method of making seamless sugar bags direct from the pulp, and without the intermediate stage of sheet paper having been invented, an enquiry was made in regard to its applicability for cartridges, and it having appeared after careful examination, to offer several important advantages, more especially with respect to strength with a given quantity of paper, economy, and still more in regard to accuracy of dimensions, that system has, accordingly, been introduced.

In the manufacture of articles, such as cartridges for small-arms, which are required by the hundred thousand, a very trifling additional operation having to be performed during their production, will materially affect the question of economy, and will frequently determine for or against its application; it is, therefore, of essential importance in manufacturing these small seamless bags, that they should undergo no unnecessary handling, or even have to be subjected to the operation of packing previous to the introduction of the bullet and gunpowder, seeing that if they are crushed or even crumpled, the process of opening, in order to receive the bullet and powder, would have to be gone through, thus involving an expenditure of time and trouble nearly equal to the value of the material. Under these circumstances the Government determined to erect a manufactory on purpose; this establishment necessarily contains the ordinary machinery of the paper maker for the reduction of the rags into pulp, and also, in addition, the special apparatus required for this peculiar manufacture, but without the sheet paper-making machinery of the ordinary paper mill.

The special apparatus required for the small arm seamless cartridge bag consists of a number of small perforated moulds, of the same form as the cartridge bag, which are clustered together on the end of a flexible pipe, in which a vacuum is kept up by means of an air pump. Each finger in this group of moulds is covered with a worsted slip cover, or mitten, and the whole cluster is then dipped into a cistern containing the liquid pulp, which in an instant is drawn upon them through the agency of the internal vacuum, combined with the external pressure of the atmosphere. The worsted mittens, with their paper covering, are then placed on driers of the exact dimensions, that are heated by steam, the whole operation of forming and drying occupying about a quarter of an hour.

The same principle of manufacture is also applicable for various other purposes, to some of which it has been already applied, and it will be fully taken advantage of in due time. When the additional apparatus that is now being constructed is completed, it will require daily 500 ammunition barrels to contain the produce. To meet this requirement, a complete plant of machinery is now being provided for the barrel manufacture.

Machinery has yet to be devised for the insertion of the powder and the bullet, as also to perform the operation of twisting and fastening the mouth of the seamless bag. As these processes are both delicate and hazardous, the contriving of a machine for this purpose is better fitted for the leisure of peace than for the feverish bustle of the last few years.

Shells.

Passing to another class of apparatus, that for the production of shells and fuzes, a subject which has occupied a large share of attention.

In 1854, the demand for the ordinary cast iron shells having been extremely urgent, many of the more eligible foundries of the kingdom engaged in their manufacture; still, from numerous difficulties which are almost invariably experienced by a new maker in producing shells of the required exactness, there was considerable delay and much disappointment experienced, both by the Government and the contractors.

Before shells can be made economically and satisfactorily, it is necessary to become acquainted with a number of minute points of detail, the knowledge of which is essential to ensure that rigid precision of form, dimensions, sphericity, concentricity of the core, and perfect soundness of the casting; qualifications which are imperatively demanded. In this extremity it was considered advisable to erect a model foundry, for the purpose of assisting new contractors with the requisite information, and also with the intention of devising a more accurate, and, if possible, a more economical system of manufacture, the method commonly employed having been considered very defective. A new foundry was built accordingly, and furnished with a set of apparatus, which more than realised all that had been anticipated; indeed, so important did the result appear, both in regard to accuracy and the economy of production, that a still larger foundry was determined upon, there being immense stores of old iron, guns, and other castings, available for the purpose of being cast into shells. Such a foundry has been erected capable of delivering 200 tons of shot and shells daily, if such should ever be required. It is provided with 50 horse-power to work the machinery, 8 large cupolas, and every facility for carrying on the shot and shell manufacture economically. The fuel and iron pass in at one side of the establishment; the moulds are conveyed by railway from the moulding area to the vicinity of the cupolas for the reception of the liquid metal, then, without having been removed from the carriage, they are conveyed onwards to the breaking up and cleaning department; the shells are put into the cleaning machine, and the moulding boxes with the core spindles undergo a rigid examination before being returned to the moulding area. The sand also has to be broken up, remixed, and sifted by machinery before it is returned to the moulders. The shells roll on to the bushing machines, after which, by their own gravity, they will roll along a suitable rail across the Arsenal, out into the river by means of a long tube, and into the hold of a vessel for transportation.

The chief peculiarity in this foundry is the moulding apparatus, which is such, that accurate shells are produced with unskilled labour after a few hours' training; its leading feature consists of an arrangement by which the pattern is drawn through the iron plate upon which the mould is formed, thus preserving the fragile edge of the mould from fracture on the withdrawal of the pattern. Each machine has two sets of apparatus, corresponding with the two halves of the mould, but the two halves have no connection until they, along with the core, are assembled on the carriage for the casting process.

The whole of the moulding and core apparatus, together with the boxes, have been made with as much accuracy as can be obtained in the present state of the arts, by the processes of turning, planing, and scraping; and it is invariably found, that with correct apparatus the chances of failure are reduced to a minimum. To perform the operations of drilling, screwing, and bushing shells, for the reception of the fuze, a large plant of compound drilling and screwing machines has been provided. In one day of twenty-four hours, during the late war, upwards of 10,400 shells passed through this machinery, a feat which probably could not have been accomplished in any other workshop in the world.

From the completeness of the arrangement, these shells only require to be lifted once, after which they roll onwards till completed; this economical system of rolling has been introduced during the war, and has proved of essential service to the department.

Towards the close of 1854, an urgent demand was made from the Crimea for wrought iron shells, an article of peculiar shape, not unlike an immense champagne bottle, which it was found impossible to get by contract in sufficient time and quantity to meet the demand. In this emergency, a factory capable of producing 100 of these shells daily was erected; it covers 30,000 square feet, contains 4 steam engines, 7 steam hammers, and upwards of 40 machines of various descriptions, many of them original and specially adapted to this manufacture; and this establishment was in operation within two months from the date of order, and that, too, during the severe winter of 1854-5, a fact which is worthy of being recorded.

These shells are made out of a single plate or slab of iron into an article resembling a bottle in form, with six or seven heatings; a remarkable example of what well-organised arrangements will accomplish. Two of the machines that are employed in this manufacture may, from their novelty, be referred to. The shells, having to be of one uniform weight, are turned in a lathe, both inside and externally. The lathe-spindle, however, is a hollow trunk, which holds a shell at both ends, and each shell is acted upon by a dozen or more cutting-tools simultaneously on both sides, and in opposite directions; thus the whole apparatus is thrown into a condition of equilibrium, and relieved of the inordinate amount of friction which would otherwise exist, and the time required is reduced in proportion. The other machine that has been referred to is for converting the red-hot cylindrical mass into the form of a bottle, which it does in less than five minutes. To have performed this operation by the ordinary means of the smithery would have involved many extra heatings of the article, would have greatly injured the material, and, at the same time, would have been very expensive. By this contrivance, the red-hot mass is put into the giant grasp of a most powerful apparatus, and is acted upon in all directions by an intense percussive force, thus leaving the article no other alternative but to change into the required shape, and without any crumpling of the edges, as might be expected.

Another branch of the shell department is the manufacture of the wooden sabots, which has been well developed. In this plant of machinery, the whole of the cutting-instruments are mounted on a combination of slide-rests, which are all actuated by one movement in their several directions, until brought into contact with a fixed stop. The adjusting of this stop determines the several dimensions of the article, while the shape is dependent on the position of the tool-holders. These things were formerly made by the ordinary tools of the wood-turner, in the usual manner; but, with this apparatus, boys or unskilled men are quite sufficient, and the relative rates of production are increased from 7 to 50.

The hemispherical interior of the sabot, where it has to fit the shell, is cut out in an equally ready manner. The gouge, or cutting tool, is fixed on a moveable centre, with the cutting edge set at the proper radius, then, by giving a forward movement with the left hand, and a sweep to the tool holder with the right hand, the true surface is produced in a few seconds, the exact depth being determined by an adjusted stop.

A very perfect and extensive plant of machinery has been provided for the manufacture of the different sorts of shell fuzes, both wood and metal, capable of producing 8,000 daily, which, for accuracy and economy, it will be found difficult to excel, and in regard to production, it is fully equal to the wants of any emergency, but to enter into detail would require more space than is at present disposable.

WAR ROCKETS.

The manufacture of war rockets is a subject which has occupied a large share of attention, and the greater portion of a plant of machinery has been erected, which will, when completed, produce 500 daily. The wrought iron tubes will be made by the lap-welding process, then cut to the proper lengths, bored, turned, and drilled by specially adapted self-acting machinery. Hitherto war rockets have been filled with the composition by hand, and driven by means of a falling weight worked by a number of men. This system is now being abandoned, and hydraulic pressure substituted. As this is a dangerous operation, the new works are removed from the vicinity of the other manufactories to a piece of ground consisting of about 114 acres, which has been enclosed from the marshes, and now forms a part of the Royal Arsenal. On this piece of ground a steam-engine, with the requisite hydraulic machinery, has been erected. The water pressure is conveyed through pipes to the several press houses, which are separated from each other by strong traverses, which, in the event of accident, may prevent communication; indeed, everything which may be considered as conducive to safety, has been done regardless of expense.

Machinery on an extensive scale has been applied to the manufacture of percussion caps, friction tubes, and to every description of this class of war stores, and also to an extensive range of articles, which are made of sheet copper or tin plate; most of these machines have been brought from America, and are well worthy of extensive application in the general tin ware manufactures of the country.

GUNS AND GUN CARRIAGES.

Passing to another class of articles—to the manufacture of guns and gun carriages, it will be found, to say the least, that the tools and machinery in the establishments of the War Department are not behind any private manufacturers, either in regard to efficiency or an economic system of production.

About the year 1780, boring mills, to be worked by horses, came to England from the Hague; these were in use till 1842, and although clumsy, were provided with veritable slide rests, and in their day must have been considered fine specimens of engineering. Between 1842 and 1851 a complete plant of machinery was introduced for the manufacture of brass ordnance, which, although on a limited scale, was fully equal to anything which has since been accomplished, and is all the more interesting from the circumstance that here the course of improvement may be said to to have commenced. In 1855 the demand for brass guns was so great that a considerable extension had to be made to the plant, in order to raise the production to twelve guns per week; and many improvements have been introduced, more especially in the casting department. Brass guns had hitherto been moulded on a loam model, requiring renewal for each casting, a system which is still employed in most of the continental foundries; this, however, has been abandoned, and a system of metal patterns with sand moulds in iron boxes has been substituted, by means of which more accurate castings are obtained, and at a less cost. Extensive additions have also been made in the erection of additional machinery for the boring and finishing branches, and also for producing the several mountings required both for brass and iron ordnance for the army and navy, in any quantity likely to be required during a period of war.

From the great failure of the iron mortars at Sweaborg, and the great difficulty experienced in obtaining iron of the proper quality and strength of metal, without previous preparation on the part of contractors, the Government determined to erect a foundry and boring mill capable of producing five heavy iron guns daily. In this establishment the great aim will be to secure metal of the strongest quality. An extensive course of preparatory experiments is now going on with Indian, Swedish and Nova Scotia irons, as also with the best of the British brands and their several mixtures; these tests are both chemical and physical, and from them important and useful results are likely to be derived.

In this manufactory of iron guns, every detail conducive to economy has also been attended to. In the foundry there are 10 wrought iron casting pits from 15 to 20 feet in depth, 20 boring machines suitable for the heaviest description of ordnance, with the other machinery and lifting cranes of a corresponding character; altogether this will be one of the finest establishments in the War Department, and fully commensurate with the present requirements of the service.

The manufacture of gun carriages had been in advance of the other departments in the employment of labour-saving machinery for working wood. During the latter part of the French war, the inventions of Brunel, Maudslay, and Bramah, were made available to a limited extent, consisting chiefly of sawing, planing, and other machines, but still the greater part of the work was done by hand labour.

Within the last few years all the improvements of modern machinery have been applied; upwards of 300 labour-saving machines have been brought into operation, besides some twenty steam-engines. In such an extensive collection, while many of the machines are common, there are a number which have been brought from America and France, that contain many novelties worthy of the attention of private manufacturers; but which, in a short paper, cannot even be named. Of the more important works may be enumerated a new saw mill, with 80 horse-power, containing all the latest improvements in sawing machinery; the saw frames are large enough to admit a log of timber 5 feet square; the mill contains a circular saw 66 inches in diameter, which is arranged to square the ends of the logs in the several frames, and to cut in a transverse line from one side of the mill to the other, the saw being moveable, and the timber stationary; it is also provided with apparatus worked by the power, for drawing the heavy baulks of timber and delivering them on the trucks between the saw frames. Adjoining the saw mills a large timber field has been laid out, which is provided with a system of railways, on which are a number of overhead travelling cranes, arranged to traverse the whole field, and to pile up the baulks of timber in the best position for seasoning.

Until recently the wheels of gun and other carriages were made entirely by hand labour; they are now wholly made by a system of copying machinery, which has been very successful, and is worth examining by private manufacturers who may still make their carriage wheels by hand. The wheel making is carried on in a room 100 feet square, covered with the saw-roof arrangement, which admits only of a northern light; it is provided with parallel lines of shafting at every twenty feet. Among the more interesting machines may be named the endless ribbon saw, which is extensively used in the War Department for many purposes; here it is used for cutting out segments and every description of intricate sawing, which it does in a style as regards both speed and quality, superior to any other. Endless ribbon knives, on the same principle, are being employed in cutting out the cloth in the flannel bag cartridge manufacture. The wheel felloes are turned in a lathe in which the *form* of the *corner* is made in the cutting tool; this tool being held in a slide rest is pushed against the revolving felloe, which is completed in a few minutes. The nave is turned in a lathe, in which the cutting tool is guided in the required irregular line, irrespective of the workman, a copy or profile of the nave being attached to the slide rest. The morticing of the felloes and naves for the reception of the spokes, is also done by machinery. The spokes are cut to the proper shape by self-acting copying lathes, in which an iron pattern of the required shape is placed, and is accurately traced by the apparatus, which is so simple, that a labourer can attend upon three machines. When the several parts of the wheels are completed, they are laid in position within a circle of six hydraulic presses, all pushing towards a common centre, by which they are quickly, securely, and firmly put together. This manufactory also contains an American dove-tailing machine, the first of the kind in England, which only requires to be known to the cabinet trade to insure its general introduction; another machine, termed the American Eagle moulding machine, has also been ordered by the War Department, but it has not yet arrived; this will also form a useful auxiliary to the cabinet making trade of this country, more especially in the manufacture of chairs: it is also used for many other descriptions of irregular copying in the United States.

A peculiar feature in the application of machinery in the War Department is, the frequent and successful attempt to congregate a number of instruments together, in such a manner that they may act on an article, or series of articles, simultaneously. To select two examples—one machine is mounted with twenty or more circular saws, on different spindles, horizontal, vertical, and at various angles, so arranged that a passage through the whirling group will produce the required shape or form; a number of pieces of timber are fixed to a moving table, and one after another pass through the saws, and are instantly transformed into shape. Again, there are machines in which some twenty or more drills are arranged in the same manner, and placed so as to drill upwards, in order to get rid of the chips; this principle of operation is extensively used for hard-wood morticing purposes, in various ways, and is very expeditious.

Ordinarily, the sand and glass preparing of wood-work, even in large manufactories, is performed by the hand; in the War Department, the glass is mounted on drums, about four feet in diameter, which are driven at a high speed; by this arrangement the work is performed more rapidly, and yet with sufficient nicety for the class of articles to which it is applied.

An extensive manufacture of wooden boxes and packing-cases is carried on, in which the whole of the preparatory work of sawing, planing, morticing, drilling, and dowelling, is performed by special machinery, leaving only the putting together to be done by hand. During the war, there were upwards of a thousand of these boxes made daily, which involved considerable expenditure of labour in the mere conveyance of the material to and from the machinery, and onwards to the central depot, where the parts are assembled. A saving of labour has been effected by an arrangement of endless horizontal bands. The principal band extends along the side of the building that contains the machinery, and is in constant motion towards the depot; within the building and from each machine is placed a series of similar, but shorter, bands, all working at right angles to the former. As each piece of wood is completed at any machine, it is thrown upon the transverse band by the workman, and by it is delivered upon the long band which conveys it to the depot, where the parts are separated into bins, ready for the workmen who put the pieces together into boxes.

The quantity of this class of articles that is required is enormous. Last year, they numbered 287,171. Of heavy mortar-beds, gun-carriages of different descriptions, with the limbers for the travelling-carriages, and traversing platforms, the large number of 3,715 were produced, and the total number of complete articles which passed through the department amounted to 445,231. Their component parts, if reckoned, would number many millions.

A considerable amount of forged wrought iron work is employed in the construction of gun carriages, and from the circumstance that many of the articles are required of the same shape, an opportuuity has been afforded of producing many of them by means of steam hammers and other machines, which, were a fewer number required, would have to be made by the hammer and hand of the blacksmith. An extensive variety of such articles is made in dies under the steam hammer; the piece of iron is first roughly bent into the shape, then made welding hot and put between the dies; a single blow squashes it into every crevice, and the fin which is left in the middle where the dies join, is afterwards cut off by being pushed through another die by means of a punching machine.

A rolling mill and scrap forge, in connection with the smitheries, has been found exceedingly useful in affording the means of obtaining peculiar forms of iron bar that are not to be had in the market, and also to work up the whole of the scrap iron of the departments. An interesting feature in this rolling mill is a method of making large flat rings, or segments of bar iron, four or five inches in breadth, and from four to eight feet in diameter; to roll such a bar into the form of a hoop is common, but the making of rings is not so general; it is accomplished by placing a rigid guide behind the last groove in the rolls, so that, as the red hot bar issues therefrom, it comes into contact with the guide, and thereby is constrained to sweep round into the curve required, which it does in an instant of time, and without any additional expense having to be incurred. An immense number of similar and equally important contrivances could be named if the time permitted, for although these minute details constitute the keystone on which the success of a manufactory mainly depends, still, from their number, they are not admissible into a general statement.

GUNPOWDER.

Of all the stores required by the war department, that of gunpowder is perhaps the most important. It is pre-eminently essential, not only that it should be the very best that can be made, but, what is even of still more importance, that it should be of uniform quality and strength, in order that the artillerist may direct his projectiles with precision and effect. The quality of gunpowder being dependent both on the careful selection of the ingredients and also on the care bestowed on the several processes of manufacture, the advantage of having an establishment to raise the standard to the highest point of attainment, is sufficiently obvious; it is also useful in controlling the price of gunpowder during the time of war. During the French war there were three government manufactories of gunpowder; there now remains but the one at Waltham Abbey. From the large stock of powder on hand at the peace in 1815, this establishment, by the year 1840, had sunk to a very low state. At that time the produce was only equal to about 3,500 barrels per annum, and the greater portion of the plant and machinery was completely worn out. In that year commenced a course of improvement which has been continuous up to the present time, the produce now being about 17,000 barrels, and, in a short time, it will amount to 20,000 barrels per annum.

One of the leading features in the many improvements is the substitution of metal for wood in the construction of the powder machinery. The wooden water-wheels, erected by the celebrated Smeaton, are being replaced by light iron wheels, with every modern appliance to make the most of the water-power.

The driving gear of the incorporating mills has been placed underground, so that in the event of explosion it may be safe from the destructive effect; and water-tanks have been placed overhead, ready at any moment, to deluge the mill in the event of explosion in the adjoining house, the communicating arrangements being self-acting.

A new system of granulating machinery has been introduced to take the place of the far more dangerous process of hand-corning. As this is by far the most critical part of the manufacture, a large amount of care has been expended to make the operations as safe as may be attainable. The machine has been made self-acting to an extent which dispenses with any attendance. A quantity of pressed cake is put into a hopper before the machine goes to work; from this magazine it supplies itself by means of an endless band, and then, by toothed rollers, it breaks the hard cake into the different sorts of grain, then, by an arrangement of sieves, it separates them and deposits the various qualities of coarse and fine grain in their respective boxes; as these boxes become filled, the machine removes them of its own accord, and puts down empty ones instead, until its supply is exhausted, when it stops of itself, and after having done so, and all danger being over, it then rings a bell for its attendant, who, meanwhile may have been reading a book in a place of safety provided on purpose.

This manufactory contains twenty-one water wheels, each on an average of four horse-power, and one steam-engine of 30 horse-power, and upon the whole is a very creditable establishment, while in regard to quality the powder is considered second to none in the world.

FLOATING FACTORY.

The numerous wants of the army in the Crimea, and its great dependence on mechanical resources, suggested the idea of sending out a floating factory. A screw steam vessel, of 600 tons, having been procured, she was fitted up as a factory, with gearing and all the usual tools of an engineer's establishment; it contained a cupola, four smith's forges, twenty-eight heavy machines, and many thousand small tools, and a general assortment of such stores and materials as were likely to be required; it also contained a complete saw mill, with all the requirements of a brass and iron foundry, an arrangement of portable engine, standards, and shafting to set up a manufactory on any level piece of ground ashore, if such should be required. The engines of the vessel were arranged to work either the screw of the ship or the machinery; and in ten weeks after the War Minister gave the order this vessel was ready for sea, with a manager and as fine a body of picked workmen as could be desired; they were all selected in the vicinity of Newcastle-upon-Tyne. On arriving at Balaklava the immense importance of the establishment was at once demonstrated; a foundry was set up on the shore, which was kept in constant employment while the vessel remained in the Crimea. Requisitions poured in from all branches of the service, which were executed with an alacrity that excited the commendation of all concerned. Seventy-nine requisitions were made for repairs to the railway plant, forty-nine from the navy, and sixty-eight from the steam transport corps, independently of the legitimate work of the factory for the Commissariat and Land Transport Corps.

The floating factory was visited by the chief officers of the French, Sardinian, and Russian services, all of whom expressed their surprise and admiration, declaring that it, together with the railway, gave them a higher opinion of England, her resources, and her settled determination to conquer ultimately, than almost any other transaction connected with the war.

Besides the floating factory, several other plants of machinery were sent out; among the rest a complete saw mill, with suitable steam engine to Sinope, another to Balaklava, with both circular and frame saws, and other machinery.

Pier and Hydraulic Cranes, &c.

Of the miscellaneous services carried out during the war, one of the most important was the erection of a pier at the wharf of the Royal Arsenal, extending out into deep water, by means of which four of the largest class of vessels can lie alongside during all conditions of the tide: and in connection with this pier is the application of hydraulic power to work the cranes.

Hitherto ships had to lie off in the river, and to be loaded or unloaded by means of barges, which were floated alongside, and to or from the wharf.

By the new arrangement four ships can draw up to the pier at one time, and by means of the hydraulic cranes, the work of a week is reduced to ten hours, the limit to speed being the time required to stow away or sling the articles within the hold of the vessel.

During the six months ending the 30th November, 113 transports, representing a tonnage of 69,975 tons, were unloaded, which is exclusive of the ships that brought home the Land Transport Corps, the troops, horses, and their several equipments. The whole expense of this service, including the steam engine and hydraulic accumulator apparatus, and the cranes, amounting to nearly £33,500, was cleared off in the saving of the time of vessels alone during the first six weeks that it was in operation—an important consideration, although secondary to the far higher advantage which it affords the War Department, in the rapidity with which it can embark war material and stores.

Until last year all ordnance stores were conveyed to the outposts in sailing sloops; but small screw steamers are now being introduced, the advantage to be derived therefrom being so obvious as to require no explanation.

The Armstrong hydraulic apparatus, for working the cranes, is also being adapted as an immense fire extinguishing engine, with an air vessel to produce the continuous squirt of water. This air vessel is in the form of a cylindrical steam boiler, with hemispherical ends, and is placed vertically. In connection therewith an iron reservoir, 100 feet in diameter, has been placed on a hill in the vicinity, 220 feet above the Arsenal, and is filled through the fire mains by the hydraulic apparatus. In case of fire, the water in the reservoir is always ready, meanwhile the steam engines, equal to 30 horse-power, will go to work on the pumping apparatus as an auxiliary, and the two combined will afford a plentiful supply of water, equal to the requirements of any probable emergency.

There are 69 steam-boilers in the War Department, —it is, therefore, of importance that everything conducive to safety and economy in fuel should be carefully attended to. In order to secure these two conditions, a system of reporting has been organised, for the purpose of showing the working history of each boiler, in regard to proof, times of examination, cleaning, and repairs, also the consumption of fuel, the quantity of water evaporated by a pound of coal, and other particulars. The greater number of the boilers are supplied with Kennedy's water meter, by means of which, precise and definite knowledge of the comparative merits of the several boilers, and the evaporating value of different coals, will be obtained.

This general statement may afford some idea of the magnitude of the various operations of the war department, though at the same time it conveys but an imperfect notion of the amount of mechanical detail which has been grappled with; such details, however, are equally important, and frequently involve greater perplexity, mechanical ingenuity, and resource than works of larger magnitude, but lying in the background they can only be known or appreciated by those who have been engaged in similar undertakings.

This subject has been brought before the Society of Arts as an humble contribution towards the practical application of science, in connection with the arts, manufactures, and commerce of the country, and I trust also it may serve to show that the appliances of the national establishments are not necessarily so deficient and so far behind as they are frequently represented to be; but that, on the contrary, they are fully equipped with the latest improvements of the age, and need not fear comparison with any private undertaking in the kingdom.

DISCUSSION.

The Secretary stated that he had received the following communication from Mr. W. Bridges Adams:—

The machinery at Woolwich Arsenal for the manufacture of wheels for gun and other carriages, is fast approaching perfection, but the wheels themselves are still the rude primitive constructions, as regards principle, that Thespis might have used in his original cart. A lump or hub of timber is cut from the butt of a tree. A series of levers are fixed round it, capstan-bar fashion, but without the proportioned strength of the capstan bars, each of which is equally strong all over, whereas each spoke is so reduced at the tenon, or holding part, where it enters the hub, that it would break short off if unsupported. The extreme ends of the levers are framed into the fellies, or string segments, two and two, in such wise that the spokes must be made weak in the direction of the plane of the wheel, in order to draw them together, to enable the extremities to enter the mortices. The fellies, where they abut against each other, are dowelled into short cross grain, produced by the curved form, and constantly break off at what are technically called the "chins," and loose segments of iron bar, technically called "strakes," are spiked on to the felly "break joint."

Such wheels as these are now only to be found in remote districts, and the only apparent reason why they are continued in government artillery, is some fancied facility of repairs when damaged in use in the field.

These wheels are so applied to the axle-trees, that the lower spoke presses vertically on the ground, in order to prevent side rack and strain. But the result of this is a total absence of elastic resilience. As the wheel revolves with its load, blows from the irregular surface of the ground, act like tilt hammers, and drive the spokes partly into the hub, and partly into the fellies, but most into the hub because it is the softest wood, rendering the whole loose. But there is a worse evil than this. No hub is equally hard all round—the weather side of the tree is the toughest—consequently the spokes drive unequally, the wheel becomes eccentric, and the irregular action is like that of a sledge hammer, rapidly destroying it.

When this class of wheel is improved, as in the ordinary omnibus, by shrinking on a hoop tyre, there is another difficulty. The spokes are thinnest in the direction of the plane of the wheel, and if the shrinking be too severe, they loose their straightness, and tend to lap round the hub, weakening the structure. As the hubs are not of equal hardness, scarcely any two wheels are alike in dish or diameter. If the spokes do not yield in the direction of the plane of the wheel, but are forced over in the direction of the axle or "dish," the tendency is to draw them forward, and leave gaps in the hub behind. When the diameter of the wheel is thus lessened, the tyre gets loose, and is then "cut and shut," to reduce it in diameter, and the gaps at the backs of the spokes are increased.

Criticism is of little use, unless the critic has a remedy to offer. My remedy is first to dispense with the hub altogether, and mitre the spokes together at the centre in an arch form, bolting them between strong wrought iron disc plates front and back. The section of the spokes is such as to leave twice the strength in the direction of the plane of the wheel, to that in the direction of the axle. Each spoke has a single felly, the joints being between; the fellies being short there is no cross grain to break off the "chins." No dowels are applied, but instead of these a thin piece of narrow hoop iron is inserted in a saw kerf, half in each felly, which keeps them in plane, while the tyre is shrunk on. No shrinking of the tyre can damage the wheel, for the elastic resilience is in the direction from back to front, tending to produce a ribbed dome-shape, the true form of a wheel.

I had come to the conclusion from theory that every spoke ought to have its separate felly, just as every leg has its separate foot, independently of the obvious disadvantage of straining the spokes to get them into the double felly. But I also obtained practical evidence of it.

Watching on one occasion the pulling to pieces of a pair of large Hansom cab wheels, the fellies of which were made of hard wood, I found almost every double felly had separated into two parts, equi-distant between the spokes, forming, in fact, single fellies, and the separations were as clear and peculiar as the sutures in a skull bone, scarcely showing on the external paint. The reason was obvious. The wheels being of larger diameter, and revolving rapidly, the alternate blows at the ends and centres of the fellies concentrated the vibrations at the centre, precisely in the mode in which axle-trees break after long service. Each spoke served as a fulcrum to produce this effect. It was therefore clear that the structure which the wheel tended to generate in action, was the true structure to begin with, unless the fellies could be made in an entire solid piece.

I tried this experiment also, constructing the wheel centres of mitred spokes, disc plated, and the fellies of a hoop of angle iron, into which the spokes abutted, and were very carelessly secured by staples round them, riveted into the angle iron. The wheels so made were placed under a cart, to carry heavy loads of iron. After being a considerable time in use, one day the angle circle escaped from one of the wheels. The driver lifted it into his cart with the rest of the load, and drove home on the spoke ends, which, when he arrived, bore the appearance of overworn crutches. The remark of one of the initiated in wheels on beholding this was, "No wheel that ever I saw before could do that."*

It is obvious that a true circular form can be preserved by this kind of centre, but there is another advantage. The wheel, being dome-form, will be elastic, and if the axle be horizontal, the spokes will never be vertical to the ground. Consequently the result will be a spring action, diminishing draught and injury to the horses, while ensuring far greater durability. It will be as though a man alights on his toes instead of his heels in jumping from a height.

I frequently conversed with the late Colonel Colquhoun, of the Woolwich Arsenal, on this subject, and he agreed with me in the principles, but the application involved such a radical change, and a new teaching in all departments connected with the working and repair of wheels, that he considered it preferable to go on in "the old way."

It is, however, a most important matter, and the facility of repairs in the field would appear to be quite as great as with the primitive wheel. By means of an efficient screw tool, this wheel could be compressed into the cold hoop tyre in the open field very rapidly, and the parts being all duplicates, no error could occur. I think common labourers would be adequate to the work after a few weeks' practice.

Wrought iron cannon to place on wheels, so as to get greater strength, appear to be conceded as a desirable thing, provided only they can be easily and cheaply made. This is a question of welding. Usually the process of welding is performed by heating the separate masses of iron and forcing them into union by violent percussion.

But what are called "cold shuts" occur in this process. Heated iron attracts oxygen from the atmosphere, and scale is formed, which separates the iron just as flour separates bakers' loaves, and prevents adhesion. If two surfaces of clean iron be placed in contact, and heated to welding point, they will unite with little pressure, and without percussion.

But it is difficult to accomplish this with thick masses, and it is worth inquiring how otherwise it may be accomplished.

The common example of a tallow candle shows us that the contact of atmospheric air is necessary to produce combustion. As long as the wick is surrounded by the hollow wall of flame, it will not consume, but protruded beyond the wall, and in contact with the atmosphere, it begins to disappear.

The use of the common forge has probably obscured the true principle of manipulation. The blow-pipe heat is the thing we require, and the forge is a very inconvenient blow-pipe. Carburetted hydrogen produces the heat we require. If the carburetted hydrogen be put under considerable pressure, it may be made to issue in jets so as to cover any surface or amount of surface we may require. If atmospheric air or oxygen be put under pressure, it may be made to impinge on the surface in contact with the carburetted hydrogen, and the flame and heat will exist at these junctions. In this mode a solid sheet of flame of great intensity may cover the surface, and no scale or oxyd can form with the flame so covering it. This flame being made to cover two opposite surfaces it is desirable to unite, when the pasty condition called welding heat is attained, union may be produced by hydraulic or other pressure without percussion or crystallisation of the metal, and a homogeneous mass will be the result. If, therefore, plate-iron be rolled up in short lengths of many folds, these short hollow cylinders may be united and a perfect cannon produced.

The desirability of cheapness and accuracy in gun stocks, has led to the invention of exceedingly complicated and accurate machinery, like the manufacture of pins. Regarding the gun as a projectile weapon, the conditions desirable are lightness for convenience of carriage, and form to give facility in taking aim. A man's eye is situated several inches above his shoulder, and to get the range of the barrel with convenient hold to the shoulder a considerable curvature is required. But when used as a spear or pike, by the addition of the bayonet, this curvature is a disadvantage, and the more so as the curvature involves short cross grain and risk of breakage. The result is a trial of compromise, and the more convenient the weapon is as a pike the less convenient it is as a projector.

It is, therefore, worth raising the inquiry whether it be not a practicable thing to substitute steel for walnut trees in the construction of stocks. The disadvantages of wood are numerous—shrinkage, brittleness, swelling, and others; and these considerations, no doubt, gave rise to the construction of the famous Doune pistols, formerly used by the Highlanders.

No doubt this change would need a new arrangement of barrel as well as stock, but if, as is probable, a weapon no heavier to carry, equally available as a projector, and superior as a pike can be produced, with a material more desirable and procurable at pleasure, the sacrifice of machinery however perfect, for other machinery producing the improved gun, would be a very profitable loss.

Mr. **ASTON** said they must all feel indebted to Mr. Anderson for his paper. The subject was one of the greatest interest and importance to the country. Some disappointment would, however, be felt by some, that more information had not been given on certain points. It was pretty well known that very large orders for machines had been given in America and this country, and that they were being fitted up in the Government establishment by the thousand, and that was, in fact, all that they had been told. But many, doubtless, hoped to have learned that evening what measures had been taken to ensure that so vast and expensive a scheme of manufacture was based on the right principles—to have been told more specifically what successful results had been, and were now being obtained—in short to have obtained more exact information, to satisfy the public that the right thing was being made in the right way. A great deal had been said of the number of machines employed in the manufacture of small arms, and much detail had been given about some minor part of the musket, but respecting the barrel, which of course was the really effective part, no information had been afforded. Surely it would have been most interesting to have known that these barrels, which are to be made at the rate of 1,000 per day, would be constructed on the best known principles, if this were really the case. Again, great stress had properly been laid on accuracy of workmanship, and they had been told that the manufacturers of this country might learn most valuable lessons from the novel construction of the machines imported into the Government establishments, by means of which the various parts of a musket were being made in vast quantities, all alike to the 1000th of an inch. They were led to infer that a system of workmanship on this scale of accuracy excelled what had been hitherto done in this country, in the reproduction of parts of machines; but, without detracting from the merit and value of American workmanship, they might remember that in the machine manufacture of this country a greater degree of accuracy than that alluded to was not uncommon. In the Lancashire workshops, parts of machinery of complicated form (the spinning machinery, for instance) had long been made in vast quantities, being all *fac-simile* copies of a primary pattern; and it was well known that there were establishments in that district where workmen in the ordinary course of their business, work to the 10,000th of an inch, and where measurements can be made the millionth of an inch. It would have been interesting to have heard from Mr. Anderson what system of measurement was employed to obtain the accuracy he speaks of, and what means are adopted to insure that the copies now and hereafter produced shall always be *fac-similes* of a primary pattern. With respect to the advantages to be gained by the public, it would certainly be satisfactory to be told that the government had now an establishment where the best arms and ammunitions of warfare are manufactured in the best manner; where the public are invited to come, examine, and learn, and in which government is prepared to teach, and work with the private manufacturer. But it was doubtful if it would be thought equally satisfactory to be told that government establishments were all at once set on foot, filled with most expensive machinery, backed up with all the resources of a public purse, in which government was prepared not to invite, but to defy, the competition of private manufacturers. It seemed to him that the public would be justified in requiring more information than had been given this evening, both as to practical beneficial results, and as to correct principles in the construction of the things made, and the manner of making them, and that, until such information be given, it could not be called upon to assent to the proposition, that the undertaking all at once set on foot on so extended a scale, was one based on prudent and sound principles.

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* The disc centre alluded to was not originally an invention of mine. It was first used by Mr. Walter Hancock in his steam carriage, but not as a disked wheel—only as a cylindrical wheel. If I mistake not there is a model of a disc mitred centre wheel in Woolwich Arsenal.

Mr. Hyde Clarke said he thought it was important that they should not misapprehend the aim of this paper. It did not occur to him, when Mr. Anderson made those remarks with regard to the American inventions which had been introduced into the Government establishments, that it was intended in any degree to represent that English manufacturers were behind our transatlantic brethren in ingenuity; but it seemed very natural, on the ground stated by Mr. Anderson, that the Government, in adopting new machinery for the purposes of the manufacture of small arms, should resort to that country and to those establishments which already afforded the best models. From peculiar circumstances—not only those mentioned by Mr. Anderson, of the dearness of labour in the United States, but likewise from the facilities which formerly existed for obtaining capital for the purpose of establishing large plants of machinery, under a limited liability, there was a facility in the United States for the introduction of various descriptions of labour-saving machinery. They, therefore, found there not only the best models for small-arms machinery, but there, also, shoemaking machinery was carried out upon the largest scale, and the sewing machine was successfully established. Therefore, he thought the Government, instead of being liable to obloquy for availing themselves of the models which they found in America, must be entitled to praise. Artificial circumstances there had given rise to the production of labour-saving machinery; but, with the recent changes in joint-stock enterprises in this country, which had taken place, it was propable that this difference would no longer exist, but that our manufacturers and inventors would have those advantages in the establishment of machinery which they had not yet enjoyed.

Mr. James Platt (of Oldham), as connected with the machinery establishments of Lancashire, to which allusion had been made, would state that he had been frequently in the habit of visiting our public establishments at Woolwich, and if, some five years ago, he had been asked the question whether he thought it good policy to construct the extensive works which now exist there, he should have hesitated in giving an opinion in favour of it, but judging by the results produced, he had come to quite a different conclusion. He had been in the habit of visiting most of the leading establishments in England and Scotland, including those of Newcastle, and he would do the arsenal at Woolwich this justice, that no other single establishment, nor any half-dozen in the country, could be compared with it. There had been an amount of ability and perseverance displayed there which he thought was entitled to the thanks of the country, and he would only say, speaking from association with other engineers and machinists, that the feeling in Lancashire was almost universal, that what had been done at Woolwich had been done with the greatest judgment, and the result would be not only that there would be great economy in the work produced, but in future they would never hear again of tools failing when brought to the test of actual use, as was alleged to have been the case in the late war. He was sure that Mr. Anderson, in his paper, had gone into matters very extensively, indeed, as much so as the time allowed. He merely rose, as a practical machinist, to bear his testimony in favour of what had been done at Woolwich.

Mr. Hobbs thought quite sufficient had been said in the paper to induce the manufacturers of this and other countries to test the principle; and he believed they would find that wherever there was a series of articles required to be produced in sufficient number at one time, the application of machinery would be found to be the best mode of meeting the case. If they wanted a dozen letters copied, perhaps the pen would do it best; but when a large number of copies was required, they must have recourse to the printing press. The same remarks applied to all kinds of manufactures. One thing in particular had been mentioned, which he thought very highly of—that was the loading and unloading of ships by means of hydraulic cranes. He thought the time was past when a person going into the London Docks, should see fifty or sixty treadmills in operation, for the purpose of loading and unloading vessels. They might, in this respect, with great advantage follow the example set at Woolwich. The details of the various manufactures, as Mr. Anderson had stated, were, no doubt, difficult to describe. He thought when Mr. Anderson found he had the plant and tools all complete, the shafting up, and the belts and machinery running, he had then only just begun. It was often the case with those who adopted machinery. They produced the wrong thing at first, but after working wrongly for a short time, they in the end arrived at the right method. When these immense establishments were first set up at Woolwich, he stated to the gunmakers of Birmingham, that they would have the laugh in the first instance, but that gradually the laugh would go to the other side of their mouths. Unless the gunmakers of Birmingham adopted some different system in manufacturing guns, they would be compelled to give up the trade. No man could walk through the streets of Birmingham without meeting large numbers of boys, carrying in their arms parts of guns; and at the lowest calculation he should say 5 per cent. of the cost of manufacture was paid in the shape of wages to those boys. He hoped that what Mr. Anderson had said with regard to the introduction of machinery would not make the country machine-mad; for a man might expend a great deal of money and labour upon a machine, and after all find he was wrong. He (Mr. Hobbs) would suggest, as a step preliminary to the introduction of machinery in any particular branch of manufacture, that they should endeavour to reform the minds of the workmen before they began. They had more to contend with in the workmen than in the want of capital. In America they might set to work to invent a machine, and all the workmen in the establishment would, if possible, lend a helping hand. If they saw any error they would mention it, and in every possible way they would assist in carrying out the idea. But in England it was quite the reverse. If the workmen could do anything to make a machine go wrong they would do it, and if the same amount of ingenuity on the part of the English workmen were exercised in producing labour-saving machinery as he (Mr. Hobbs) had seen displayed in producing the least amount of work in the longest possible time, England never need fear that other nations would go ahead of her in this respect. He thought the great obstacle in the way of the gunmakers of Birmingham in introducing machinery, was the opposition of the work-people to such innovations. They thought if they could by any possible means raise the cost of production, no matter by what means, they were doing good service. If any machinery was adopted for reducing the cost of manufacture—not the wages of the workman, the men nevertheless set their faces against it. Unless they could get the workmen to go heartily with them from the first, he (Mr. Hobbs) would advise them to be careful how they attempted to introduce machinery.

After a few remarks from Dr. Wampen,

Mr. Wm. Smith said, he thought it would be useful to be informed by Mr. Anderson, whether he had found any advantage in dividing the work to be performed into a number of separate processes, to be accomplished by a number of different machines, instead of performing the greatest number of operations in the same machine. He had observed in visiting the works at Woolwich, that a great variety of articles heretofore produced by hand, was by simple machinery now produced with great rapidity and uniformity. There was, in particular, one article on the table which he believed had not been alluded to in the paper, viz., a sword scabbard. It was a very simple-looking article. The quantity of material removed as compared with what remained in the finished article was great, and the form such that he imagined the operation was somewhat difficult of accomplishment by machinery.

Mr. Anderson replied, that if the article was heavy and difficult to handle, and required but little to be done to it, then perhaps one machine was best; but where, as in the case of the wooden lining of the scabbard, the operations had to be repeated, and many thousands of the article produced, it was very different. In making fuses or other small things, it was found the most economical to hand them from one boy to another through the several stages until they were completed, and by so doing a smaller amount of wages was paid in the aggregate than if a single person produced the same article. With regard to the scabbard lining on the table, it was just as it left the tool. It was done entirely by the sawing process. It was first cut out by the endless ribbon saw, and the groove was formed by a circular revolving cutter. It was the same with regard to the outside of the article; the tool being set to the proper curve produced the form.

Mr. Newton remarked with regard to Mr. Anderson's paper, they must be all agreed that it was a highly interesting one, and that he had put as much matter into it as he could for one evening. It was very well for gentlemen to wish to have detailed explanation of machinery, but when they considered the enormous number of machines that were required for the various operations, they would see that if the details, even of a few of them, had been given, the other portions of the paper must necessarily have been imperfect. If Mr. Anderson would be kind enough to furnish them with a series of papers upon a series of machines, they would no doubt be highly interesting. Col. Colt, he believed, was the first to introduce a series of machines for the manufacture of pistols and fire-arms generally, and these were as complete as they well could be. But in the application of that machinery, Col. Colt expressed the very difficulty to which Mr. Hobbs had referred.

Mr. Thos. Webster, F.R.S., remarked that the speech of Mr. Hobbs could not fail to impress upon their minds the fact that it was more difficult to engineer men than to engineer matter. The account Mr. Hobbs had given of the difficulty which masters in this country experience in getting their workmen to adopt improvements in manufactures, as contrasted with the state of things in America, was very remarkable. The history of strikes showed how much of the invention of this country had been due to this cause, for many of the leading machines of the present day, the mule and others, and also Mr. Peter Fairbairn's machine for the treatment of flax, were due to the necessity which existed of getting rid of a class of workmen who at one stage controlled a series of operations. The statement of Mr. Hobbs upon this subject could be amply confirmed by all who were acquainted with the progress of invention in this country. Mr. Newton had mentioned the experience of Col. Colt as to the difficulty of getting skilled workmen to carry on the operations of his machines. He (Mr. Webster) could inform them of a similar occurrence in the establishment of Messrs. Ransome and May, at Ipswich. By means of the simplification of their machinery, the most ordinary unskilled men could now perform the work which was previously done by skilled labour. The subject of strikes had, on a former occasion, been profitably discussed by the Society, and it was a question which related more to the education of the people than perhaps any other with which he was acquainted.

Colonel O'Connor said, as a common fighting soldier in the bush, he would draw the attention of Mr. Anderson to two important weapons. It was very easy on Woolwich Common, with eight good horses and as many artillerymen, to dash off with heavy field-pieces, but when they got to Africa, conveying a gun through jungles, over swamps, and through deserts, it was a very different matter. In the last campaigns in Africa he had a 24-pounder gun; it required 40 horses to drag it and 80 negroes to move it, and after all it stuck fast. The best weapon he considered for that mode of warfare was the Congreve rocket, from 12 to 24-pounders; these were very successful in storming stockades, an operation which could be effected with success at a distance of 800 yards. Where guns were used in such a country they must be of a very light description, and easily transportable.

Mr. Winkworth said, that he rose rather to confirm an opinion given by his transatlantic friend, Mr. Hobbs, in the course of his speech, than to dicuss any of the points arising out of Mr. Anderson's paper. The opinion to which he referred was, that English workmen are indisposed to permit the introduction of improvements calculated to economise manual labour. He was sorry to say that his experience in early life as a silk manufacturer, fully bore out the proposition, so far as that branch of trade was concerned. He was old enough to recollect the introduction of the first factory for winding off dyed silks, so as to supersede the expensive and slow process of hand winding at home, when the owners were threatened with personal violence and the destruction of the building. Then came the wooden drawboy, which was held to be a dangerous substitute for the previous and slower method, and the Jacquard, which was a still greater innovation, against which all the strength of prejudice and numbers was arrayed. But if these were invasions on the rights of individual personal labour, it followed as a natural consequence, that power loom weaving was the climax of wrong inflicted by the hard-hearted employers on their suffering workpeople. What destruction of property and even loss of life attended the introduction of these and other improvements, was now matter of history, and he only regretted to be obliged to add that what was true of this branch of industry, applied more or less to the annals of improvement in almost every other. It followed, therefore, that operatives, though keeping pace to some extent with the intelligence of the age, were in their original ignorance as regards this point, and required instruction in that important section of political economy, which teaches the right use and the inestimable advantage of improvements in the science of frugality of labour. With respect to the many exquisite specimens of mechanical art on the table, the pleasure of admiration was much qualified by the painful consideration that they were devised with elaborate skill for the destruction of that which, under ordinary circumstances, we took so much pains to preserve, namely, the image of God as seen in human life. The only consolation which these frightful appliances for certain death afforded, arose from the argument that the greater and more immediate the slaughter the sooner the occasion for their use would cease. He could not sit down without expressing his thanks to the author of the paper, for the admirable epitome he had given them of the skill and ingenuity which had been so successfully displayed in the public department in which he was engaged.

The Chairman said it now remained for him to move a vote of thanks to Mr. Anderson for the very interesting, important, and valuable paper he had communicated to the Society. He had drawn attention to the wonderful development of machinery under his superintendence during the last few years. This country had now a great military arsenal, such as a great mechanical nation ought to be proud of, and perhaps there was no person to whom they were so much indebted for the efficiency of the machinery in this department as to Mr. Anderson. England was essentially a mechanical country, and it was our true policy to make our mechanical resources available for our military defences. This country had been found at the outbreak of war to be deficient in its preparations, but from what they had heard this evening, they had no reason to apprehend that such would be the case in the event of another war. He fully concurred in the observation contained in the paper, that the admirable machinery introduced into the war departments at Woolwich and elsewhere, had not only been attended with the most beneficial results as regarded the department itself, but would give a stimulus to the mechanical resources of this country. He hoped the details of this machinery would be communicated by Mr. Anderson at some future time, so as to enable the constructors of machinery to have the full benefit of the instruction which Mr. Anderson was so well qualified to convey.

A vote of thanks to Mr. Anderson was then passed.

The Secretary announced that, in consequence of severe domestic affliction, the Rev. W. Rogers was unable to attend and read his paper as announced for next Wednesday, and that under these circumstances, a paper by Mr. Bashford, of Surdah, East Indies, "On Experiments with Silkworms, with a View to Improve the Present Silk Yieldings in Bengal," would be substituted for it.

PRIZE FINANCIAL ESSAY.

The following are the conditions relating to the competition for the prize of 200 Guineas, placed in the hands of the Council of the Society of Arts by Mr. Henry Johnson, to be awarded for "The best Essay on the present financial position of the country as affected by recent events, in which the principle of a sinking fund should be discussed, and also an investigation made as to the best mode of gradually liquidating the National Debt."

Conditions.

1. The Essays to be sent to the Society of Arts by the 31st day of December, 1857. Each Essay to be marked "Finance Essay," and to have a motto or distinctive mark attached, which mark must also be written on a sealed letter, containing the name and address of the author.

2. The Essays will be delivered by the Council of the Society to the adjudicators, who will fix a day for making their award, which will be more or less distant, according to the number and size of the Essays.

3. The letters, containing the names and addresses of the authors, will remain with the Society of Arts, and none will be opened except that bearing the motto, or mark attached to the Essay to which the adjudicators award the Prize.

4. The adjudicators shall not be expected to give any reasons for their award, beyond stating that in their judgment the Essay is the best that has been submitted to them upon the subject, and is worthy of the Prize, nor shall they be expected to give any opinion as to the soundness of any sentiment or theories which the Essay may contain.

5. When the adjudicators are prepared to make their award, a special meeting of the Council shall be summoned, and the Chairman shall then open the letter which bears the motto or mark attached to the successful Essay, and the Secretary will then communicate with the author.

6. That in case the author of the successful Essay shall be unwilling to print and publish the Essay at his own expense, then the copyright shall belong to the Council of the Society of Arts, who may publish the whole or any part of it, as they may think proper.

7. That the unsuccessful Essays shall be returned to their authors when claimed, with the seals of the letters unbroken.

8. That the number of the adjudicators to be appointed by the Council be three.

9. The Council reserve to themselves the right of withholding the prize entirely, in the event of the adjudicators reporting that in their judgment no Essay sent in is deserving of the reward.

⁂ Each Essay must be written in a plain legible hand, and only on one side of the paper, and it is recommended that it be as brief as is consistent with the importance of the subject.

BESSEMER IRON.

The following account of experiments in reference to this process conducted at the Coats Iron Works, Glasgow, by Messrs. Jackson and Company, will be read with interest:—

"The experiments were conducted, as nearly as possible, according to the method described to the public by the patentee. The form of the Bessemer furnace used was cylindrical, being 18 inches in diameter and with 6 tuyeres, each three-eighths of an inch in diameter, entering almost on a level with the bottom of the furnace. The pig iron used was one of the best brands of the firm, (Eglinton) and No. 1 or softest quality; the quantity operated on about 8 cwt. The pig iron when melted, in the ordinary foundry cupola, was run direct into the Bessemer furnace which had been previously well heated. The blast was then applied, and beginning at a pressure of 8lbs. was raised during the process to 11 lbs. and afterwards allowed to descend to 5 lbs. The appearance of the action going on was similar to that usually ascribed to it; and when, from the subsidence of the ebullition and the change of flame to a purple colour, the process was deemed concluded, the metal was run off into moulds (18" × 4" × 4"). These blooms, after cooling, were re-heated and rolled into bars, and these, cut up into equal lengths, were piled 9 high and again rolled into bars, the same mode having thus been pursued as that adopted to manufacture marketable iron. The iron was found quite unfit for commercial purposes from its brittleness. The per centage of loss was invariably much greater than by the old process, being as high as 17 per cent. above the usual waste."

Home Correspondence.

STEAM-SHIP ARITHMETIC.

Sir,—In a paper read by me at the meeting of the British Association at Cheltenham, in August last, on "Mercantile Steam Transport Economy," I brought before public notice that a system of steam-ship arithmetic might be based on the formula usually adopted for determining the co-efficient or index number of dynamic duty of steam-ships, namely, $\frac{V^3 \ D^{\frac{2}{3}}}{\text{Ind. H. P.}} = C$, the numerical values of "C" having been experimentally determined for vessels of the different types of build for which the arithmetical calculations may be required. This paper has led to many inquiries of me for more specific information as to the mode of applying the formula, such, for example, as the letter of "Inquirer," in the *Mechanics' Magazine*, No. 1,745, who says, "I shall feel obliged if Mr. Atherton will inform me whether by the co-efficient of dynamic performance he means the useful effect, or if not, what it refers to." I am glad to find that the subject "Steam-Ship Arithmetic," based on the mutual relation of displacement, power, and speed, as dependent on the locomotive or dynamic qualities of the vessels employed to do the work of mercantile transport service, and for which in the end the public have to pay the cost, whether done ill or well, the difference between doing the work ill or well involving probably millions per annum, is now at length attracting public attention. I have, therefore, much pleasure in responding to the inquiry thus publicly made, by explaining the views which I entertain, defining, to begin with, that V is intended to express the speed in knots or nautical miles, of 2,028 yards per hour, D the displacement expressed by the number of tons weight of water which the hull of the vessel displaces at the time of trial, allowing 35 cubic feet of water to the ton, and Ind. h. p. is the gross working power as measured by the unit equivalent to 33,000 lbs. raised one foot high per minute. Hence the co-efficient "C," or index number x, is a mere numerical indication, which will be a constant number for vessels of the same type, but not necessarily a constant number for vessels of different types. It, therefore, when deduced from vessels of different types, becomes a series of index numbers "x," whereby we may be able to compare the adaptation of ships of dissimilar type for the performance of gross locomotive or dynamic duty, including the locomotion of the respective ships themselves, propelled by the engines at such rate of speed as may be, and in all this it is supposed that the nett effective power of the engines is in a constant ratio to the gross indicated power. The numerical values of the co-efficients or index numbers (x) being thus practically ascertained by the actual trial of ships of known constructive elements or types of build, the index number of any particular ship may then be applied as a constant number, not to vessels indiscriminately, but to vessels of *similar types of immersed form*, whatever be the immersed displacement "D," intended speed "V," or intended working power "Ind. h. p.," thus completing the equation $\frac{V^3 \ D^{\frac{2}{3}}}{\text{Ind. h. p.}} = C$, from which any two of the three quantities, V, D, and Ind. h. p., being given, the third may be found, as will be hereinafter exemplified. It is thus only by having ascertained the co-efficients or index numbers actually realised by vessels of known types that we are enabled to assign the co-efficient that an intended vessel about to be constructed may be expected to realise. It is my conviction that neither mathematical investigation nor legislative intervention, will by itself alone be adequate for realising perfection in naval construction. Experience must be resorted to and made available as above set forth, but I believe that mathematical investigation, combined with a complete system of statistical registration, giving us the ordinary load displacement of ships, and the available working power of steam ships expressed by their indicated power, or any other definite unit, will do a great deal towards enabling us to realise, appreciate correctly, and bring to book, the results of experience, and thence by an analysis and comparison of the distinctive elements of dissimilar vessels, of which, in each case, the index number has been determined, we may be led to discover and adopt those elements of build which conduce to efficiency for any particular service, and reject all dogmas thus found to be practically ill adapted for the production of dynamic efficiency. Such is the primary use of the formula $\frac{V^3 \ D^{\frac{2}{3}}}{\text{Ind. h. p.}} = C$. It enables us to assign definite index numbers or numeral values to the performance of steam-ships, instead of the general panegyrics in which the trial performances of new steam-ships are usually spoken of. The co-efficients "C," or, as I have called them, the index numbers (x), produced by vessels of dissimilar types and of dissimilar engine-construction, vary greatly. The index number "x," is sometimes as low as 120, frequently as low as 150, it frequently reaches 200, and in some cases the index number 250 is said to have been attained. I believe that at the present time it is more frequently below 200 than above that number, and as the index number is affected not only by the type of form and smoothness of the hull at time of trial, but is also dependent on the greater or less efficiency of the engines (for the Ind. h. p. is the measure of the gross power, not of the nett effective working power of the engines), it is evident that in the case of a vessel not realising so high an index number as may have been expected from her type and form, it will become a subject of professional inquiry whether the deficiency be attributable to the hull or the engines.

It is further an important matter in favour of this principle of determining the comparative locomotive merits of steam-ships, that by substituting the consumption of coal "W" expressed in cwts. per day of 24 hours, the merchant will have the means based on his own Counting-house data of testing the performance of his steam-ships and of determining whether the success or failure of any particular service may be attributable to the constructive qualities of the vessel or to her mercantile management. This view was brought forward in my essay on "Steam Ship Capability," 2nd edition, appendix No. 4, and on this matter I observed in my Cheltenham paper as follows:—

"Further, this formula may be rendered available as a Counting-house check on the working operation of steam-ships, simply by substituting the consumption of coal expressed in cwts. per day of 24 hours "W" in lieu of the Ind. h. p.; for, one cwt. or 112 lbs. per day of 24 hours is at the rate of 4.66 lbs. per hour, which is probably about the ordinary consumption per Ind. h. p. per hour, and it ought not to be exceeded. If, therefore, in lieu of the Ind. h. p., we substitute the consumption of coal calculated in cwts. per day of 24 hours, the resultant coefficient "C" will afford an approximate indication of the good or bad performance of ships as compared one with another, and the fact of an inferior performance being thus detected, the cause to which it may be attributable, whether to inferior type of form or foulness of bottom, or inferior adaptation of engine, or inferior construction of boiler, or inferior management on board of ship, will then become the subject of professional inquiry: thus, the merchant, by aid of his Counting-house statistics of displacement, time on passage of given length, and coal consumed, will be enabled to detect the fact of inefficiency, and it will then be for the professional engineer to detect and remedy the cause thereof. The enunciation of the formula, or the mercantile rule above referred to, is as follows:—Multiply the cube of the speed, expressed in knots or nautical miles per hour (V^3), by the cube root of the square of the displacement ($D^{\frac{2}{3}}$), and divide by the consumption of coal, expressed in cwts. per day of 24 hours, the resultant numeral coefficient "C" will indicate the dynamic or locomotive efficiency of the vessel; and such is the variable condition of steam-ships in present use, that the coefficient has been found to be as low in some cases as 120, whilst in other cases it has reached the number 250."

Now, as an example of the application of the formula $\frac{V^3\ D^{\frac{2}{3}}}{\text{Ind. H. P.}} = C$: suppose a vessel about to be constructed 175 feet length on deep draught water line, 25 feet breadth, and 10 feet draught of water exclusive of keel, to be built on lines which give a displacement of 500 tons at the draught referred to, and that from previous experience of the type of build or comparison with vessels of a similar type, we have reason to expect that the coefficient or index number will be 200, and we wish to know what amount of Ind. h. p. will propel the vessel at the speed of 14 nautical miles per hour.

In this case $\frac{V^3\ D^{\frac{2}{3}}}{\text{Ind. H. P.}} = 200$, or Ind. h. p. $= \frac{V^3\ D^{\frac{2}{3}}}{200} = \frac{(14^3)\ 500^{\frac{2}{3}}}{200} = \frac{2{,}744 \times 63}{200} = 864$ Ind. h. p. That is, the engines, whatever may be their *nominal* power, must be capable of working up to 864 Ind. h. p. to propel the vessel at the speed of 14 *nautical miles* or knots per hour.

If the intended speed be 14 *statute miles* per hour, which is equal to 12.15 knots, then we have Ind. h. p., $= \frac{(12.15^3) \times (500^{\frac{2}{3}})}{200} = \frac{1{,}794 \times 63}{200} = 565$ Ind. h. p., being 300 Ind. h. p. less than is required to attain the speed of 14 *nautical miles*, and yet "miles" are frequently spoken of without any distinction being made as to whether nautical miles or statute miles are intended.—I am, &c.,

CHARLES ATHERTON.

Woolwich Arsenal, Jan. 27, 1857.

HUMAN LONGEVITY IN AMERICA.

Sir,—In an article on "human longevity," in the last "Edinburgh Review," I find the following sentence, so far confirming my views of the condition of the white races in the United States:—

"From Professor Tucker's analysis of the American Census, from 1790 to 1840, published a year ago, we derive the strange result, if true, that the chances of living to above 100 years are 13 times as great amongst the slaves, and 40 times as great in the free negroes, as in the white population of the country."—I am, &c.,

W. BRIDGES ADAMS.

VEGETABLE FIBRES.

Sir,—The paper recently read at the rooms of the Society, by the hon. and learned gentleman, the Chief Justice of Honduras, embodying, as it did, an important mass of information, historical, geographical, statistical, and commercial, on the affairs of that colony, extended to a length by no means disproportionate to its value, but tending to limit the discussion which generally succeeds to the perusal of the leading object of the night's meeting. The late hour at which I was enabled to offer a few observations upon one branch of the question, necessarily compelled me to restrict them within the least possible compass. The question of colonial vegetable fibres, to which I exclusively addressed myself, is one, the importance of which is only beginning to be understood in this country, and whatever may be calculated to throw a light upon the subject, I cannot but regard as falling naturally within the scope of the views of the Society, and I shall be glad to find that you can afford space for an attempt to show the real value of the question.

In the consideration of matters of this nature, suggesting, as in the present case, measures calculated to effect considerable changes in affairs of a commercial character, it is well to show the bases of operation, and fairly to consider the consequences on all sides.

Putting out of view, for the moment, that important subject, cotton, at present the leading fibre of the world, I shall limit my observations to those classes of fibre which partake of the character of flax and hemp, as being calculated to substitute, to a considerable extent, new materials adapted to all the purposes for which flax and hemp have been, until recently, exclusively employed.

In treating this question I must necessarily make special reference to the trade of Russia, as it will be seen that the chief imports of those commodities have ever been from that country. For this purpose, and to show the growing nature of those imports, I need not travel further back than the present century, and, under each head of flax and hemp, I will give the imports from 1801 to 1853, divided into five decennial periods and the three concluding years, the last of these dates being the year before the commencement of the late war. It will be seen that I give the total imports and annual averages for each period, and first for flax:—

Flax Imported from Russia from 1801 to 1853.

YEARS.	Total Import in each period.	Annual average in each period.
	Tons.	Tons.
1801 to 1810	147,118	14,712
1811 to 1820	144,301	14,430
1821 to 1830	271,325	27,132
1831 to 1840	372,700	37,270
1841 to 1850	498,781	49,878
1851 to 1853	153,170	51,057
Totals and averages in 53 years	1,587,395	29,951
Imported from all other parts in 53 years	665,027	12,547
Grand totals and averages for 53 years	2,252,422	42,498

At the low average price of £40 per ton for the whole term, the total value of flax imported in the 53 years was—

	£90,096,880
Of which came from Russia	63,495,800
Leaving, from all other parts	26,601,080

Of the portion imported from other countries than Russia, nearly the whole was from Holland, Belgium, and Prussia.

I will next proceed to show the state of the trade in hemp for the same term of 53 years:—

HEMP IMPORTED FROM RUSSIA FROM 1801 TO 1853.

YEARS.	Total Import in each period.	Annual average in each period.
	Tons.	Tons.
1801 to 1810	326,062	32,606
1811 to 1820	266,186	26,619
1821 to 1830	242,955	24,295
1831 to 1840	288,657	28,866
1841 to 1850	280,924	28,092
1851 to 1853	100,405	33,468
Totals and averages in 53 years	1,505,189	28,400
Imported from all other parts in 53 years	324,102	6,115
Grand totals and averages for 53 years	1,829,291	34,515

At an annual average rate of £35 per ton, for the whole term, the value of hemp imported from Russia, in the 53 years, was £52,681,615.

I do not here compute the value of the remaining portions of the articles imported elsewhere than from Russia, which, although not all strictly hemp, are brought under that head in the official accounts from which the above figures are taken. There are certain limited quantities of actual hemp brought from various European countries, and a considerable quantity obtained from a species of the plantain tree, grown in the Philippine Isles, and imported under the name of Manilla hemp. But the chief imports now, other than from Russia, are from our East Indian possessions, amounting to considerably above 20,000 tons a year, a portion of which is Sunn and Bombay hemp, but chiefly jute, articles which, a few years ago, were scarcely known in this market.

Returning now to Russia, I have shown that the value of flax imported from thence, during the last 53 years, was—

	£63,495,800
And of hemp	52,681,615
Together	£116,177,415

Being an average of above two millions a-year for the whole period. But, taking the last 20 years, the flax and hemp imported from Russia has been of the average value of fully three millions sterling a-year. This sum, however large, constitutes but about one-third of the total value of our imports from thence, which have averaged, for some time past, from eight to ten millions per annum, whilst, within the same period, the value of British and Irish produce and manufactures exported to that country has been under £1,200,000 per annum.

I stated at the recent meeting, that the island of Jamaica, and colony of British Guiana, being the colonies to which my attention has been more immediately directed (to which I added Honduras, then under discussion), were capable of producing every pound, in fibres of various kinds, suited to almost every purpose to which Russian flax and hemp can be applied, and, in many cases, far superior in quality to those products which constitute the value of three millions a-year, or the full amount of our imports from Russia of those commodities. I made that statement advisedly, and I adhere to it. And I may ask, if the welfare of our colonies be an object of interest in this country, how it happens that so large a source of wealth as this branch of industry is capable of providing should have been so strangely overlooked?

I have been long of opinion that our West India colonies have been grossly neglected. To use a familiar phrase of our north-country brethren, "the cold shoulder has been given to them" with a vengeance; and possessions, the value of which will be discovered if we should ever have the misfortune to lose them, are most unquestionably deserving of a much higher degree of aid and encouragement than it has been the practice, of late years, to afford them.

To illustrate the question of the value of the British colonies, I will very briefly give the results of a carefully compiled and comprehensive statement, which I drew up, in the year 1849, for the trade of the preceding year, with a view to satisfy myself of the comparative value of the home and colonial, as contrasted with the foreign, consumption of our manufactures and produce. I took, on the one side, every foreign country of the world, except China; and, on the other side, all British colonial possessions, except the East Indies, placing those possessions against China, on the foreign side. With these two exceptions, the result was, that all the foreign countries of the world took from us an average value of 2s. 2d. per head of their populations, whilst the British colonies, considered alone, took at the rate per head of twenty times that amount; but taking, conjointly, the home and colonial trade against the foreign, the rate of consumption per head of the united population was above fifty times that of foreign countries.

In this statement, Russia figures, as a consumer of our products, for the large sum of 8d. per head of her population. But such has been the decline from even that low rate, in her imports from this country since that date, that her present consumption of our products (I here speak of the years 1851, 1852, and 1853), has fallen to barely 5d. per head, being below the rate of any other country in the world.

It may be said that, since 1848, such has been the enormous increase of our exports, that a computation such as I have here referred to, is of no present value. Granted, the immense increase. But our colonies have maintained their full proportionate rate of advance since 1848; and I will now venture to make a statement—challenging a denial of its accuracy—that, whilst the consumption of all foreign countries, excepting China, is, at present, below 3s. per head, that of the British colonies, excepting India, maintain the proportion of twenty times that rate. If this be so, then surely colonial interests are worth the fostering to a much greater extent than it has been lately applied to them. And there—not to extend my communication, already too long—I will leave the question. Yours, &c.,

J. B. SHARP.

44, Myddelton-square, 16th January, 1857.

VENTILATION.

SIR,—The principles on which good ventilation depend have been long well known, yet in practice they are rarely adhered to. They consist in the supplying a sufficiency of fresh air for respiration—the getting rid of that which has been vitiated, and the avoidance of draughts of cold air.

In manufactories these principles were carried out by the late Mr. William Strutt, and at the Panopticon, near Petersburg, and proved to be efficacious and economical. The late General Sir Samuel Bentham recommended that navigable vessels should be provided with pipes for the admission of fresh air, besides those for the exit of that which had been vitiated.—(See "Naval Papers," No. VI., p. 49.) Yet, even in emigrant ships the ventilation is only effected by opening the doors and windows. Lately, a manufacturer has invented the means of heating air behind a common grate, which process effects the ventilation at a cheap rate. The life of persons condemned to earn their livelihood in close rooms, has been much commiserated, but the immediate effects of such confinement might be greatly mitigated by the ventilation of their workrooms. Dr. Arnott's air pump might conveniently be used to keep up a constant current of heated air for this purpose, and might be set in motion by clock work, or even by a common kitchen jack.—I am, &c., M. S. BENTHAM.

26, Wilton-place, January 24.

Proceedings of Institutions.

Bexley Heath.—The Society for the Promotion of Useful Knowledge has just held an exhibition of Works of Art and Science, as well as curiosities of general interest, which commenced on Tuesday, the 6th, and continued for the next three days. This Society possesses a library of some 500 volumes, and is the medium by which lectures and concerts are given to the neighbourhood throughout the winter. Last year its managers got up a very creditable exhibition, but this year they have succeeded in making great advances upon the last. The kindness of the surrounding gentry in lending their most valuable paintings, models, and gems of every description, is deserving of imitation throughout the country. Over and above the paintings, which lined the walls of the large Boys' School-room, several of which were of great value, there was a very beautiful statute of Psyche, belonging to Oswald Smith, Esq., several fine bronzes, including the "Dying Gladiator," Jacquard-loom specimens, choice Bohemian glass, Chinese and Indian curiosities, North American Indian dresses and manufactures, a seal-skin dress and cap of a sailor of the *Resolute*, Crimean trophies, and other objects of interest, including a most beautifully illuminated missal, in perfect preservation, the model of a royal Burmese war-junk just brought to England, and the interesting metal aluminium, and a most elegant chess-table exhibited in 1851 at Hyde-park. The Society, being in connexion with the Society of Arts, had the benefit of a large number of photographs (besides a quantity of scientific apparatus), and especially of the new photogalvanographic engravings, which were universally appreciated. In addition to these, there were stereoscopes of various kinds; whilst several microscopes, under the superintendence of Flaxman Spurrell, Esq., afforded much gratification.

Birmingham.—A *soirée*, in connexion with the Birmingham and Midland Institute, was held on Friday evening the 23rd inst., at the Music-hall, Birmingham. The attendance was numerous, and included the Rev. Dr. Badham, Mr. A. Ryland, and Mr. John B. Hebbert, Vice-Presidents of the Institute; Dr. Bell Fletcher, the Rev, A. O'Neil, the Rev. Mr. Hodgkinson, Alderman Manton, Mons. Achilles Albitès, Mr. Joseph Gillott, Councillor Holland, Councillor T. Osborn, Councillor E. C. Osborne, Mr. J. Hinks, Mr. W. Mathews, jun., Mr. Wiggin, Mr. S. Timmins, Mr. W. C. Aitkin, Mr. Everitt, Mr. J. S. Dawes, Mr. George Shaw, Mr. Henshaw, Mr. A. Kenrick, Mr. Charles Clifford, Mr. George Downing, Mr. P. Hollins, Mr. Howell, Mr. George Jabet, the Rev. J. M. Aston, Mr. W. R. Lloyd, Mr. W. M. Williams, Mr. Ball, Mr. Prime, Mr. Prime, jun., Mr. Green, Mr. Whitworth, Mr. Barker, Mr. T. C. Saunders, Mr. Whitehouse, Mr. T. P. Salt, Mr. M'Callum, Mr. F. Elkinton, Mr. Forbes, Mr. Horton, Mr. Chambers, Mr. W. Barlow, Mr. J. D. Goodman, Mr. A. Morgan, Mr. Dixon, Mr. Hill, Mr. J. F. Griffiths, Mr. W. Morgan, Mr. Radclyffe, Mr. Shakspeare, Mr. B. Smith, Mr. R. Heaton, Mr. S. Findley, Mr. C. M. Ingleby, Mr. R. T. Chance, Mr. R. L. Chance, jun., Mr. J. Dotterill, Mr. J. Syson, Mr. R. B. Taylor, Mr. P. Hollins, Mr. Henry Williams, Mr. Southall, Mr. S. Goddard. Mr. Blakemore, Mr. Davis, Mr. E. Heeley, Mr. T. Martineau, Mr. J. C. Woodhill, Mr. J. J. F. Winfield, Mr. W. H. Reynolds, Mr. Deykin, and many others. Colonel Sykes, chairman of the East India Company, and Chairman of Council of the Society of Arts, with whom were Mr. Sheriff Mechi and the Rev. Dr. Booth, attended as a deputation from the Society of Arts, to explain the system established by the Society for the examination of students attending classes at Literary and Scientific Institutions, and for awarding prizes and certificates to meritorious candidates. Mr. Ryland, one of the vice-presidents, presided, and, in the course of his opening address, alluded to the benefits which would accrue from the Institute being taken into union with the Society of Arts—an important step, as it would secure for the industrial department valuable privileges. There was also a letter from Mr. M. D. Hill (Recorder of Birmingham), in which he expressed his regret at being unable to attend, and his hearty wishes for the succeess of the Institute. The Rev. Dr. Badham spoke a few words to the classes for whose advantage the Institute had been established, and the Chairman then proceeded to deliver the certificates to the successful pupils; to Herbert Brown, for proficiency in physics; to C. J. Woodward, for the same; and to Joseph Lucas, Thomas Griffiths, and Newton Walsh, for proficiency in chemistry. In presenting the certificates he commented upon the high compliment which was conferred upon them in being the first recipients of honourable distinction, and trusted that they would make the Institute proud of them. Colonel Sykes, chairman of the Council of the Society of Arts, said they were all aware of the liberal feeling which pervaded the whole country, that all classes of society should have their intellectual faculties advanced and strengthened. They saw throughout the kingdom the efforts which were being made on behalf of the operative classes, and they only wished that those efforts might be successful. Mechanics' Institutions effected much good in supplying links in the chain which was broken in infancy, and their object was to impart a knowledge which might be of use to the recipients. He was followed by the Rev. Dr. Booth who said that a few years ago the Society of Arts, flushed with the success of the Great Exhibition of 1851, turned its attention to the consideration of how it could still further benefit the country; and it appeared to the Council that if the different institutions for the working classes throughout the country could be brought to combine together, great advantages would result. This union had been most successfully effected—a proof that the people were disposed to place confidence in that body in which the Great Exhibition had originated. Dr. Booth then gave some account of the origin and results of the Society's Examinations, and afterwards proceeded to address those young men who were preparing to come up to their examinations in London this year, for next year he hoped the centres of examination would not be confined to London, but that, if Birmingham was willing, they would hold examinations there. The Society hoped to be able to spread their operations all over the country, so as to hold out inducements to the whole community to turn their attention to intellectual acquirements, and take them away from sensual enjoyments. He looked upon the efforts of the Society of Arts as inaugurating a great educational movement. The examiners were not particular as to where the knowledge was acquired. Their sole object was to ascertain that they possessed that knowledge. And just as if a person were to take a handful of genuine Australian nuggets, and, walking down Birmingham streets, would not find a single buyer if he offered them for a few pence, whereas if he took them to the Mint and had them stamped with her Majesty's head, he would soon find a ready market for them—so with these young men who came up to London, they, the rough nuggets of precious ore, might not be known or appreciated until they had stamped upon them the test of the Society's examiners, when it was to be hoped they would be received as gladly as the bright sovereigns from the Mint, and be treated accordingly.—Mr. Mechi next addressed the company, and was followed by Mr. Fairbairn, of Manchester, who moved a resolution in favour of the examinations, which was seconded by Mr. J. F. Winfield. Speeches were subsequently delivered by Mr. Scholefield, M.P., the Rev. Mr. Dale, Mr. Buckmaster, and other gentlemen; and a vote of thanks was passed to the deputation from the Society of Arts for their attendance. Colonel Sykes, in acknowledging the compliment, assured the meeting that the deputation had not come to Birmingham to advocate the cultivation of the intellects of its operatives upon the principle of material advantage alone.

BURY.—The fourth annual meeting of the members of the Bury Athenæum was recently held in the large hall of the Institution. John Robinson Kay, Esq., of Bass-lane House, the president of the Institution, occupied the chair. In commencing the proceedings, the Chairman said he had pleasure in meeting the members once more at the annual meeting of the Institution, which was one of some importance, inasmuch as the report of the directors for the past year would be read. He called upon Mr. Joseph Pomfret, the secretary, to read the annual report, from which it appeared that during the first quarter there were 429 adults, 94 juniors, 58 females, 68 annual, 35 life, and one honorary, making a total of 685 members. In the same quarter in 1855 the number was 761. In the second quarter there were 400 adults, 103 juniors, 50 females, 69 annual, 35 life, and one honorary, making a total of 658 members. In the corresponding quarter of 1855 the number was 683. In the third quarter there were 357 adults, 73 juniors, 33 females, 70 annual, 35 life, and one honorary, making a total of 569, against 599 in 1855. In the fourth quarter there were 435 adults, 123 juniors, 63 females, 70 annual, 35 life, and one honorary, making a total of 727. In the same quarter in 1855, the number was 674, thus showing an increase of 53 members. The demand upon the books in the library during the past year has been greater than at any previous period since the opening of the Athenæum. An annual subscription of five guineas had been paid for the privilege of receiving a selection of the newest works from Mudie's library. The Ellesmere box of biographical works had also been received from the Lancashire and Cheshire Institutional Association. During the year, 47 volumes of new and popular works had been purchased, which, together with 19 volumes which had been presented, caused a permanent addition to the library of 66 volumes. The following are the issues during the year:—History, antiquities, biography, and anecdotes, 2,091; geography, voyages, and travels, 769; mathematics, natural philosophy, and natural history, 879; fine arts, useful arts, social and domestic economy, 499; mental and moral philosophy, philology, criticism, and political economy, 471; poetry and the drama, translations from Greek and Latin classics, 338; novels, tales, miscellaneous and collected works, literary and scientific periodicals, 6,589; giving a weekly circulation of 232 volumes. Arrangements were made for a course of lectures to be delivered by different gentlemen, but the lectures failed to attract the public, and the result was a loss to the Institution. The news-room had been preserved in a most efficient condition, and had had the effect of attracting new subscribers. In the early part of the past year, one cheap concert was given under the auspices of the directors, the result of which was very satisfactory. The direction of the concerts has since been changed, the choir having them now under their own control entirely, and simply hiring the hall for the performances. During the year elementary singing classes have been established; the advanced class now numbers forty, and the junior class twenty-five members. There was a debt on the building amounting to £517 4s. 8d., and an effort had been made to raise by subscription the amount required for its liquidation. The sum of £339 1s. had been promised towards the object. The following classes are now in operation: adult writing and arithmetic class, 54 members; junior ditto, 75; female ditto, 15; French class, 14; English grammar, 29; instruction in fine arts, 13; ornamental drawing class, 12; female ditto, 3; mechanical ditto, 21; general ditto, 15; singing class, 65; choir, 60; chemistry, 4; total number of members in the classes, 315.

LEIGHTON BUZZARD.—A lecture was delivered at the Town-hall, in connection with the Literary and Scientific Institution, on Wednesday evening, by Joseph Simpson, Esq., of London, (late Librarian of the Islington Literary and Scientific Society,) on "The Life, Character, and Times of Henry VIII." The first part of the lecture treated of those traits in the monarch's character which were most conspicuous during the early part of his reign, among which his vanity and love of pleasure were especially prominent. A description of his court was then given, and the unbounded influence of Wolsey over the king also noticed. The character of the Cardinal was next very ably dwelt upon. The question of the divorce, and the circumstances in connection with it, then followed, in which the characters of Anne Boleyn, Jane Seymour, and the other wives of Henry the Eighth, the king's conduct in reference to the divorce, and his cruel and unjustifiable treatment of his various wives, were discussed at some length. The manner in which this part of the subject was handled, and the sentiments and reflections with which it abounded, were received with unmistakeable expressions of approval by the audience. Mr. Simpson next drew attention to the origin, progress, and results of the Reformation, considering its bearing, not only upon that age, but tracing its inestimable benefits down to the present time. In conclusion, the lecturer briefly but impartially summed up the character of Henry the Eighth. Although this lecture occupied an hour and a-half in delivery, the attention of a large and highly respectable audience was sustained and riveted to its close.

ROYSTON.—At the Institution on Friday evening, 23rd January, W. Parker Hamond, jun., Esq. (of Pampisford Hall), delivered an interesting lecture, entitled "Notes of a Tour in Spain and a Residence in Barcelona during the Insurrection of the Past Year." The members of the Institute are deeply indebted to Mr. Hamond for his generosity in thus allowing them to profit by his travels.

MEETINGS FOR THE ENSUING WEEK.

MON. Royal Inst., 2. General Monthly Meeting.
London Inst., 7. Mr. Charles Salaman, "On the History of Music, especially in connection with National Dances."
Entomological, 8.
Chemical, 8.
TUES. Royal Inst., 3. Prof. Huxley, "On the Sense of Hearing."
Civil Engineers, 8.
Linnæan, 8.
Pathological, 8.
WED. London Institution, 3. Mr. E. W. Brayley, "On Mineralogy and Crystallography."
Society of Arts, 8. Mr. F. Bashford, "On Experiments with Silkworms, with a view to improve the present silk yieldings in Bengal."
Geological, 8. 1. Mr. Cleghorn, "On the Formation of Rock Basins." 2. Mr. Rubridge, "On the Copper Mines of Namaqualand, South Africa."
Pharmaceutical, 8½.
Royal Soc. Lit., 8½.
THURS. Royal Institution, 3. Prof. Tyndall, "On Sound."
Zoological, 3.
Philosophical Club, 5½.
London Institution, 7. Dr. R. E. Grant, "On the Natural History of Extinct Animals."
Antiquaries, 8.
Philological, 8.
Photographic, 8. Anniversary.
Royal, 8½.
FRI. Archeological Inst., 4.
Royal Inst., 8½. Dr. J. H. Gladstone, "On Chromatic Phenomena, exhibited by transmitted Light."
SAT. Asiatic, 2.
London Institution, 3. Mr. T. A. Malone, "On Experimental Physics, chiefly in Relation to Chemistry."
Royal Institution, 3. Prof. Phillips, "On Successive Lands and Seas."
Royal Botanic, 3¾.
Medical, 8.

PATENT LAW AMENDMENT ACT.

APPLICATIONS FOR PATENTS AND PROTECTION ALLOWED.

[*From Gazette, January* 23*rd*, 1857.]

Dated 21*st November*, 1856.

2762. William Jacobs, Albert-road, Globe-fields, Mile-end—An improved composition for bedding and rendering bricks in furnaces.

Dated 8th December, 1856.

2903. Charles John Lewsey and George Nasmyth, Bucklersbury—Improvements in the treatment and application of woods used in the construction of casks and such like vessels, and for other purposes.

Dated 6th January, 1857.

51. Charles Emilus Wright, Green-street, Blackfriars—Improvements in preparing lubricating compounds.

Dated 7th January, 1857.

57. Charles Frederick Claus, Latchford, Cheshire—Obtaining tin or compounds of tin from the scraps or clippings of tinned sheet iron.
58. James Morris, New Kent-road, Surrey—Improvements in washing machines.
59. Peter Pilkington and Thomas Entwisle, Accrington, Lancashire—Improvements in machinery or apparatus for washing, cleaning, agitating, grinding, polishing, or mixing various materials.
60. William Joseph Curtis, 1, Crown-court, Old Broad-street—Improvements in railway axle-tree boxes.
61. William Young Smith, 77, Sydney-street, Sheffield—An improvement in sawing all kinds of wood.
62. Henry Charles Hill, Croydon, Surrey—Improvements in screw and lifting jacks, and in machines for lifting, pressing, and lowering.

Dated 8th January, 1857.

63. George Pate Cooper, Walworth, Surrey—Improvements in the manufacture of shirt collars.
65. Rupert Newton, Birmingham—A new or improved manufacture of metallic boxes.
66. Wright Prestwich, Oldham—Improvements in gas burners.
67. Edward Joseph Hughes, Manchester—Improvements in the manufacture and application of compounds resembling gutta percha and caoutchouc, from flour, fibrine, gelatine, and other vegetable and animal substances. (A communication.)
68. James Harris, Hanwell, Middlesex—An improved lock, and method of acting upon lock-bolts, latches, taps and valves, railway and other signals, bells, and other like apparatuses.
69. Alexander McDonald, Polished Granite Works, Aberdeen—Improvements in the manufacture of columns, pilasters, and other similar structures of granite, marble, porphyry, jasper, serpentine, sienite, and other stones capable of receiving a high polish.
70. Thomas Lawes, 77, Chancery-lane—A machine or apparatus to be used in cleansing, purifying, and drying animal and vegetable substances.
71. Thomas Ball and John Wilkins, Nottingham—Improvements in manufacturing looped fabrics, suitable for the making of gloves and other articles.
72. John James Russell, Wednesbury, and Joseph Bennett Howell, Sheffield—Improvements in the manufacture of steel tubes, applicable to the flues of steam boilers and other uses.
73. Thomas William Keates, Chatham-place—Improvements in the treatment of Rangoon naphtha, and other varieties of petroleum.
74. John Roberts, Upnor, Kent—Improvements in the stoppering or closing of jars, bottles, and other vessels, applicable also to the joining of earthenware and other pipes.
75. Robert Turnbull, Harwich—Improvements in cradles for heaving up ships.

Dated 9th January, 1857.

76. John Rock Day and Joseph Lester Hinks, Birmingham—Improvements in constructing and attaching knobs and handles of drawers and doors, cupboard turns, and other such like articles.
77. John Henry Johnson, 47, Lincoln's-inn-fields—Improvements in machinery or apparatus for sewing or uniting and ornamenting fabrics. (A communication.)
78. Robert Smith, Longridge, near Preston—Certain improvements in the manufacture of corded skirtings and corded petticoats.
79. John Henry Johnson, 47, Lincoln's-inn-fields—Improvements in the application of the electrotype or galvano plastic processes. (A communication.)
80. John Anderton Carruthers, Over Darwen, near Blackburn—Improvements in the mode or method of forming the lease or shed in sizing, warping, or weaving.
81. James Hardacre, Manchester—Improvements in machinery or apparatus for preparing cotton, wool, and other fibrous substances to be spun.
82. Joseph Gibbs, Abingdon-street, Westminster—Improvements in extracting gold and silver from their matrices and from other substances or materials with which they are combined, mixed, or associated.

Dated 10th January, 1857.

84. John and Christopher Gratrix, Preston—Improvements in looms.
85. Louis Julien Brethon, Tours, France—Improvements in machinery for manufacturing draining pipes, bricks, tiles, and all other similar plastic articles.
86. David Dunne Kyle, Albany-street, Regent's-park—A method of retarding or stopping railway trains and carriages, applicable also to carriages on common roads.
87. John Adams, 13, Ivy-cottages, Queen's-road, Dalston—A Minié or other rifle-sight on a new and improved plan.
88. John Chanter, Borough-road, and John Wakefield, Suchicore, Dublin—Improvements in the fire-boxes or furnaces of locomotive engine boilers.
89. James Hodgson, 16, Sweeting-street, Liverpool—An improvement in constructing wrought iron masts, yards, bowsprits, and other ships' spars.
90. Francis Xavier Kukla, Raven-row, Mile-end-gate—Improvements in apparatus for heating stoves by gas.
91. Charles Richard Olliffe, Park-lane, and James Anning Gollop, New Oxford-street—Improved apparatus for cleaning knives.
93. Paul Desrues, Paris—Improvements in purifying gas.
94. William Watt, Belfast—Improvements in treating or preparing Indian corn and other grain and amylaceous vegetable substances for fermentation and distillation.
95. Richard Archibald Brooman, 166, Fleet-street—Improvements in galvanic batteries and in apparatus connected therewith. (A communication.)
96. Richard Archibald Brooman, 166, Fleet-street—Improvements in propelling ships, boats, and other vessels. (A communication.)

Dated 12th January, 1857.

97. Benjamin Biram, Rotherham, Yorkshire—Improvements in machines for washing coal and other minerals.
99. Arnold Goodwin, 69, Guildford-street—An improvement in fixing the tubular flues of steam boilers.
101. Uriah Scott, Camden-town, and Frederic Holdway, Bayswater Improvements in the manufacture of metal type, and the arrangement of the same for various purposes.
103. Richard Chrimes, Rotherham, Yorkshire—Improvements in apparatus for regulating the pressure of fluids.

Dated 13th January, 1857.

105. John Hinks and George Wells, Birmingham—An improvement or improvements in metallic pens.

WEEKLY LIST OF PATENTS SEALED.

January 23rd.

1741. Ferdinand Potts.
1742. John Onions.
1748. Henry Doubleday.
1754. James Ashman.
1758. George Collier and John Crossley, and James William Crossley.
1770. Thomas Wrigley.
1772. Samuel Jay and George Smith.
1776. Julien Denis.
1778. Charles Hodges.
1783. Henry Remington.
1857. Wm. Hall, Elisha Wylde, and William Waite.
1884. Peter Armand le Comte de Fontainemoreau.
1896. William Church and Henry Whiting Hamlyn.
1920. Philippe Pierre Hoffmann.
2482. George Chappell Potts.
2758. Charles Tooth.

January 27th.

1786. Henry Robinson.
1787. Edmund Eaborn and Matthew Robinson.
1791. William Griffin and Elizabeth Duley.
1819. John Watkins Brett.
1823. Eugene Perre Chevalier.
1839. Josiah Firth and Joseph Crabtree.
1849. Alfred Vincent Newton.
1867. Joseph Leese, junr.
1871. William Edward Newton.
1881. Archibald Lockhart Reid.
1885. John Cartland.
1907. John Burns Smith.
1921. Louis Auguste Joyeux.
1930. Andrew Peddie How.
1931. Charles Marie Chouillou.
1937. Robert Jobson.
1941. William Edward Newton.
1950. Joseph Maudslay.
2151. John Buchanan.
2257. Charles Renshaw.
2341. William Nehemiah Parsson.
2417. Richard Ford Sturges.
2639. Henry Bessemer.
2707. George Pye.
2731. John Jones and Edward Jones.
2749. William Morgan.
2777. William Edward Laycock.
2788. Charles Edwin Heinke.
2796. Jacob Levi Elkin.
2861. Frederic Siemens.

PATENTS ON WHICH THE THIRD YEAR'S STAMP DUTY HAS BEEN PAID.

January 19th.

142. Robert Angus Smith and Alexander McDougall.

January 20th.

150. Cyprien Marie Tessie du Motay.
153. Peter Spence.
183. John Bird.
226. Richard Garrett.
251. Alfred Vincent Newton.

January 22nd.

162. John Lockart, jun.
190. Archibald Lockhart Reid.
193. Thomas Wicksteed.
194. Thomas Wicksteed.
243. Rd. Archibald Brooman.

WEEKLY LIST OF DESIGNS FOR ARTICLES OF UTILITY REGISTERED.

No. in the Register.	Date of Registration.	Title.	Proprietors' Name.	Address.
3938	Jan. 23.	Improved Buckle	Charles Rowley and Co.	Birmingham, London, and Manchester.
3939	„ 24.	Turnover Collar	Arthur Newman Dare	88, Piccadilly.

Journal of the Society of Arts.

FRIDAY, FEBRUARY 6, 1857.

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CONVERSAZIONI.

The Council have arranged for two Conversazioni for the Members of the Society and their friends, the first to take place on Saturday, the 21st of February, to which ladies will be invited; the second on Wednesday, the 6th of May, to which gentlemen only will be invited.

NINTH ANNUAL EXHIBITION OF INVENTIONS.

The Council have fixed Monday, the 23rd of March next, for the opening of the Ninth Annual Exhibition of Recent Inventions.

Persons intending to contribute to the Exhibition should communicate with the Secretary forthwith, stating—

1. The title of the invention.
2. Whether the article will be a specimen, model, or drawing.

Articles for exhibition must be forwarded to the House of the Society, *carriage paid*. The days for receiving articles are, Thursday, the 5th, Friday, the 6th, and Saturday, the 7th of March.

All articles should be accompanied with a short description of the invention, for the Catalogue, with a wood-block (when possible), and a reference to any publication where a fuller account may be found.

MEETING OF COUNCIL.

Feb. 4, 1857.

At a Special Meeting of the Council held this day, the following Resolutions were passed unanimously:—

"Resolved,—That the Secretary be instructed to inquire of the Institutions in Union whether they consider the time has arrived when, in order to give just facilities, throughout the United Kingdom, for acquiring knowledge in Art and Science, it is expedient that the National Museums situate in the metropolis and elsewhere, such as the National Gallery, the British Museum, the Museum of Ornamental Art, the Museum of Practical Geology, and the public Museums in Ireland and Scotland, &c., which have already acquired, or may hereafter acquire, by Parliamentary votes, specimens of Art and Science, should be rendered, as far as may be practicable, useful to the Local Institutions promoting Art, Science, and Literature, throughout the United Kingdom, especially the Mechanics' and Literary Institutions in Union with the Society, and Free Libraries.

"Should it be the opinion of the Institutions that the time has arrived, the Council of the Society of Arts request that they may be favoured with opinions as to how the object may be best carried into effect, and the Council will be prepared to afford facilities for the discussion of the subject.

"Resolved,—That a copy of this resolution be sent not only to the Institutions in Union, but also to the Provincial Museums which may not be in connection with the Society, and to the Free Libraries in the United Kingdom."

THE PRIVY COUNCIL OFFICE AND THE SOCIETY OF ARTS EXAMINATIONS.

The Lord President of Her Majesty's Privy Council having placed at the disposal of the Council of the Society the privilege of nominating two candidates as competitors in an Examination recently held by the Civil Service Commissioners for Clerkships in the Privy Council Office, the Council of the Society recommended to his Lordship, Robert Abbott, of Leeds, and William Matthew Taylor, of Windsor, both of whom had distinguished themselves at the Society's Examinations in June last. The Council have pleasure in announcing that their candidates have been successful, standing first and fourth on the list.

There were twenty-one selected competitors and five vacancies.

NINTH ORDINARY MEETING.

Wednesday, Feb. 4, 1857.

The Ninth Ordinary Meeting of the One Hundred and Third Session was held on Wednesday, the 4th inst., Thomas Winkworth, Esq., in the chair.

The following Candidates were balloted for, and duly elected members of the Society:—

Anderson, Pat
Cowper, Rt. Hon. William Francis, M.P.
Pitman, Edward
Rolleston, George, M.D.
Thompson, Richard.
Wyld, James.

The following gentlemen have been appointed Honorary Local Secretaries:—

James Spiers, Esq., for Oxford.
C. Ratcliff, Esq., for Wolverhampton.

The Paper read was:—

ON EXPERIMENTS WITH SILKWORMS, WITH A VIEW TO IMPROVE THE PRESENT SILK YIELDINGS OF BENGAL.

By F. Bashford, of Surdah, East Indies.

I have devoted my attention to silk reeling in Bengal for nearly twenty years, and have laboured hard to profuce a thread as fine, as perfect in the reel, and as well suited for manufacturing purposes in Europe, as French and Italian silk. I have succeeded so far as to merit the Medal of the Society of Arts, for my comparatively superior quality over other Bengals, none for many years past approaching Surdah (J. and R. W. Mark) by several shillings per pound in value. My reel has considerably surpassed China, and come up very close in the finer sizes to middling Italian in its various appliances and value, as a reference to any price current or manufacturer in England or Lyons will corroborate; still I find that I am far behind the finest sizes of both France and

Italy, and with a view to approach more nearly to them I have imported eggs of the finest cocoons reared in both those countries, with a view to engraft them upon the different species of worms indigenous or at present common in Bengal, and I received also a large quantity of the best China eggs with the same view, as the cocoons of that country are also superior to all we have in Bengal, although their silk is inferior.

I am desirous to give the result of my exertions to the public, as it may be a guide to others; and the giving myself this flattering introduction is to show that the experiments have been made by a practical man, who has charge of forty filatures, working 4,500 basins, and therefore interested in the favourable results of such experiments, and in any good that may accrue from the publicity of these remarks.

To enable my readers to understand the subject thoroughly, I will commence by mentioning that all our worms in Bengal for filature silk give us several crops of cocoons during the year, except a solitary species of annual, origin unknown, and rapidly becoming extinct.

The chief worm is what is called the dessie, or, as the word implies, country,—and I therefore conclude it to be aboriginal or indigenous; it supplies nearly all the cocoons of the large November bund, or cold weather crop of Bengal, and yields the finest silk; the cocoons are small, and it is therefore sometimes called the chota poloo, or small worm in some districts; the produce of the best quality may be taken at about 10,500 cocoons to the pound of silk; this worm thrives best in the cold weather, and the cocoons are better then than the after crops, but it continues more or less in the different districts throughout the year; the period from the hatching of the egg till the completion of the cocoon of this worm is about thirty-six days in the cold weather, but much less as the heat increases.

The next species of importance is the madrassie; the native meaning of the word is seaborn, and I therefore conclude this to be an important species; it is sometimes called nystree; it is produced throughout the year, but thrives much the best in the hot weather, from March to September, is remarkably hardy, and easily and economically reared; from this species we derive in the March and rainy bunds a very large supply of cocoons; the produce is comparatively better than that of the dessie, about 10,000 of the best cocoons being required to produce one pound of silk, but the fibre is neither quite so strong nor the colour so bright, though it nevertheless produces a very good thread if carefully reeled; these worms pass through their stages so rapidly, that from the time of hatching to the completion of the cocoon is frequently not over 25 days. Thus, you see, two distinct species of cocoons are providentially arranged for our different seasons.

The next is the boro polo, or in English—large worm. This is an annual, and I cannot trace its origin; it existed when the East India Company first imported Italian eggs, all of which soon failed. The boro polo is now chiefly found in the Radnagore district, and from this worm they get much of their March bund; but it is failing fast; it used to exist in other districts, and the silk from it was very beautiful, and the produce nearly double that of other cocoons, but from frequent failures, irregular hatching, and greater expense in rearing, and being an annual worm only, the natives have taken a dislike to it, and I fear it will soon be as scarce in Radnagore as it now is in other districts; they have another species of worm in Radnagore, called the China, but how it acquired that name I do not know, as in China their worms are annuals, and this is not; the cocoon is certainly unlike in shape and very inferior to the China, and even inferior to our dessie and madrassie. I have now described the best species of our Bengal silkworms, and I have shown that it requires 10,000 of our best cocoons to produce me one pound of good silk; in France 2,500 cocoons produce the same quantity of silk. This disparity in produce between the Bengal and European cocoons must forcibly strike every reader of this paper, and the natural suggestion will be, that if Bengal could produce cocoons equal to French and Italian, the quantity of worms they now rear would nearly supply the whole of Europe with silk.

Actuated by a desire to improve our cocoons, and seeing no reason to doubt the possibility of it in a country so beautifully supplied with mulberry and every convenience for rearing worms as this is, I imported a large quantity of the best French, Italian and China eggs to engraft upon the different puny species of our Bengal monthly race.

I had no desire to introduce an annual, as this is a worm only intended by nature for cold climates, where there is but one crop of mulberry in the year; here, we no sooner cut down our bush mulberry, than it springs up again, and in 5 or 6 weeks we have a second luxurious crop; in a country, therefore, so bountifully and continually supplied with mulberry, an annual worm (which at best is always irregular) is not required, and would not be encouraged by the natives.

I imported the annual eggs merely for one crop of cocoons that I might have the moths to couple and cross upon our Bengali monthly race, and give new strength and vigour to that. I now proceed to explain the nature of my experiments, and their results.

In February, 1854, I received per overland a large quantity of the best French silkworms' eggs; they were however indifferently packed, and only 5 or 6000 eggs were good out of a very large parcel; some of these commenced hatching about 15 days after the box was opened, with the thermometer ranging form 60 to 70 Fahrenheit, and they continued hatching very irregularly for about three months, during which time the thermometer at midday reached about 100 in the house.

I treated the little worms precisely as the worms of this country, feeding them at first with finely-cut tender mulberry leaves, giving the larger and older leaves as they increased in size and strength; they fed and thrived very well, displayed a better constitution, and more hardy nature than our country worms; their stages of sickness were in the colder weather at six to eight days' interval, but more rapid as the heat became greater; they got over them very well, and but few died until near the time of spinning, when the usual disease attending our country worms attacked some of these, from which they chiefly died, recovery being very rare. As we have no remedy for these diseases the usual fumigations were tried, but with little success.

The healthy few of the early incubations, astonishingly large and strong compared to our country stock, were placed to spin in mat frames, such as are used by the natives in their rearing establishments, (as I used them from the beginning to become habituated to the very convenient custom of this country), and they gave very beautiful cocoons, some quite equal in size, shape and firmness to the samples received with the eggs, and seemed to spin in our frames, as easily (these mat frames take up little room and are vastly more convenient than twigs,) as they do on the twigs in France.

I was quite pleased with the cocoons, and the natives were truly astonished, they had never seen any like them: the later worms having to bear extremely hot weather, did not succeed so well. The irregularity of hatching was very inconvenient; and referring to the old East India Company's experiments I find similar complaints of their Italian eggs, (though they never attempted to cross and naturalize as I am doing). Having so far succeeded with the cocoons, I allowed the moths to eat out and then obtained both male and female moths of our dessie and madrassee stock, and paired the French male with the country female and the country male with the French female. The disparity of size was immense; however impregnation was effectual; and the eggs were deposited in due time, both pairings alike giving eggs of a yellowish colour, when deposited, but after three days those from the French female and Bengal male turned dark and remained unhatched until the next year, passing through our hottest season with the thermometer frequently at 105°; here was my first disappointment; the eggs from the French male and the country female remained yellow until the seventh day, when they displayed a dark speck, rapidly changed to slate colour and all hatched on the tenth day. The young worms were strong and healthy, and fed well, but were more rapid in their stages, owing as much perhaps to the warmer weather as to their altered nature; the same diseases attacked some of these, a few days before spinning, which had proved fatal to a few of the first batch; the operation of spinning was more tardy at the commencement, the cocoons more flossy, and less firm than the original; they were quite as large, but altered in shape, being very round at one end and pointed at the other, without the least contraction in the centre, or shewing much resemblance to the French, except in the larger size and stronger fibre; there was a vast improvement upon the Bengali stock. These worms, from the time of hatching to spinning, occupied thirty-four days.

I kept all the cocoons for seed, pairing nearly all of them in themselves, fully expecting that this one cross would suffice, and realize my wishes of improving our breed without altering their nature of hatching; however, I was sadly disappointed, for on the third day all the eggs turned black, and remained thus until the following year. The very few of this cross that I did not pair in themselves, were paired with indigenous moths, making a second cross for the French male; of these the cross female with the country male, followed the steps of the preceding; the cross male with the country female hatched, but owing to very bad weather, I did not succeed in getting any cocoons to continue the family, and thus ended all my labours in this department for the year 1854, with what success my readers can judge. I reeled off a few of both the pure and cross cocoons that I had reared, and the silk was quite equal to the best French; the best cross cocoons, though changed in shape, gave nearly as good produce as the pure, and as strong a fibre. The change in the shape did not in any way detract from its produce or reeling quality, which is generally supposed to be the case on the continent. As I before remarked, I had Italian and China eggs, and the result was precisely the same as with the French. It may be asked, why I imported the China eggs, when the China silk is inferior to our own reel. My reply is, that China cocoons, although small, are infinitely superior to our own dessie and madrassie sorts, and, in my opinion, capable of making, with good management, as fine and valuable a silk as Italian; and the reason the Chinese reel is of inferior quality to these, is entirely owing to their own bad management.

I commenced the year 1855 with the first cross French, Italian, and China females upon our madrassie and dessie stock, and second cross French. Italian, and China males produce upon our females, which had gone back to annuals; and about the time these eggs began to hatch in January, 1855, I received another large supply of French eggs, which were hatching on arrival. They were in beautiful order, having come out on cloth loosely packed. I had now such a quantity of eggs of different sorts, that it was very difficult to keep them separate; however, they had as much care bestowed on them as possible. Incubation of all the crosses went on as irregularly as with the first importation, and it was several months before any one batch had finished hatching. This year's experiments were interrupted by my being ill, and compelled to go to England for a few months, but a great many cocoons were obtained from the different crosses and paired in themselves, which gave eggs that turned black, and remained in statu quo until the next year. A few of the pure French were kept pure, but some were crossed upon the last year's crosses, and the result left unknown until incubation; the following year there was very little difference in the cocoons over last year's, the offspring of the China female retained its original white colour, but the shape altered to a point at both ends; the cocoon, if anything, was larger, and the fibre seemed as strong as the parent cocoons, and this was the case with the fibre of all the other crosses. This was a very unfavourable year for experiments, and many thousands of the worms died.

On my return from Europe, I found a good supply of healthy looking eggs of the different sorts, and have continued the experiments this year (1856) with unabated perseverance. They began hatching early in January, but just as irregularly as before; a small quantity only came out daily, and did not cease till May. The early worms were all good, fed and thrived as well as I could desire, and the cocoons from them were very fine. I had an opportunity of again comparing the pure French cocoons reared by me, with the different crosses, and the choice was greatly in favour of the pure, but the cross cocoons were vastly superior to those of Bengal; and what I reeled off in the filature gave a most beautiful silk, and a yield in quantity more than twice as large as the common cocoons of this country, which we were then reeling in the filatures; thus, much of the intrinsic value of the French cocoon remained, but none of its original shape. I supposed now, that I had so far reduced the original nature by the frequent crosses, as to be nearly certain of their now assimilating in habits, &c. &c., with our country worms, and I did not reduce them by further crossing, but allowed the moths to couple with themselves; great was my astonishment to find, after the eggs had been deposited three days, that most of them had turned black, indicating that they still had too much French nature; a few remained yellow, and hatched after ten days. How to account for the freak of nature with regard to the rest, I do not know, but I had still to be more surprised after this. I had to wait, of course, until next year, to see the result of the black eggs, but those that hatched gave me ample occupation for the time, and I watched and cared for them with the greatest interest; the young worms looked healthy, ate, and throve well, and in due time gave cocoons; the white colour alone proved the China portion, and the superior size of cocoon fibre, and lighter colour of some, with less gloss than with our common worm, showed the French and Italian cross. I was, on the whole, satisfied with this cross, and trusted my labours had met with success, but great was my astonishment after the pairing, to see more than half of these eggs again revert back to annuals, though there had been a complete break in their nature by their having hatched in January, given cocoons in February, eaten out in due time, paired in themselves, deposited eggs that ten days after hatched, and now to fall back, not to hatch again until the ensuing January 1857, I fancy is extraordinary in the extreme. From the portion that hatched I had another crop of good cocoons, and their eggs I distributed to several parts of India. Strange to say, many of those reverted back to the nature of annuals, and from those that did not, owing to bad weather at the time of spinning, but very few, much reduced in strength and quality, are left to me to continue my experiments. I am now in the midst of the rains, our worst season for cocoons, but still I have these few, and am bestowing on them the greatest possible care; what may be their ultimate fate I must leave for a future communication. I have many pounds of eggs of the different crosses still retaining the nature of annuals, but as I have spent three years in trying ineffectually to engraft a superior nature and invigorate our common stock, I feel discouraged, and would gladly have the opinion of naturalists as to the probability of my object ever being attainable, and the proper steps to be taken for realizing it.

I have every belief in the possibility of improving our Bengal silkworms, under a better system of management; and have no doubt, those of Europe have only acquired their present perfection by care and tuition. The superb cocoons I saw at the late French Exhibition, were a proof what art and careful management can produce.

Silkworms are said to have been originally imported from China. I have lately seen specimens of the best domestic cocoons now being reared in that country, and those common in Europe are more than double their size and weight in silk, thus clearly proving that the worm has either degenerated in its natural country, or that European skill has worked the vastly improving change in its nature and constitution; this latter, I think, is the truth the main difference in the cocoon is in the size, the shape being still much the same. I, however, allude to the China white cocoon only.

In Syria, the cocoons are in size and quality nearly equal to French, and as their climate is not far different from Bengal in our dry season, I see no good reason why we should not be able to produce as fine cocoons. A long and tedious crossing may be necessary to work the change, but whatever labour is required, the immense improvement in quality and produce that is certain to result would amply compensate for both labour and expense; and as the gain would be a public good, the Government and public should encourage the undertaking. I am willing to present eggs to any one disposed to follow my steps, and the more diffused the experiments the better chance of success.

I am not satisfied that the present domestic races of silkworms are not originally wild, and fed on other food than mulberry; the forests of India teem with various species of silkworms feeding on all sorts of leaves; accident may have led to the choice of mulberry, and it certainly is the best suited for yielding a mellow and easy winding silk.

I have not been able to make any experiments on any wild silkworms, except on the *Bombyx Huttoni*, but I believe it possible to domesticate a great many of the wild species, and, by changing their food, to make them produce a silk less harsh and crude than they now do, and cocoons that will yield their thread freely, without the aid of alkali or other chemicals just as the domestic worm does. The Société Zoologique d'Acclimatation are producing wonderful changes, and why should not we do the same in silkworms. I see no reason to the contrary.

As this paper may fall into the hands of practical people in Europe, who may be disposed to aid a good object, I will subjoin a few remarks upon the mode of rearing silkworms, usually practised by the natives in Bengal. I am not sure if their defective system could be remedied, whether the produce of our present stock of worms could not be vastly improved, so as to render the importation of foreign species unnecessary. These remarks will enable my readers to form an opinion on the subject, but I must mention that the natives are so pertinaciously callous of improvements if they involve any labour or expense, and are almost as immoveable in their prejudices as the pyramids, that unless any beneficial changes can be effected in a most simple and inexpensive way, I have little hope of their attempting and persevering in them.

In the first place I will try and describe the mulberry, and mode of cultivating it. The sort chiefly grown here is the wild black species, both the indented and unindented leaf, planted indiscriminately, a handful of cuttings of both sorts forming one bush; and these bushes in rows, about a foot apart, cover large tracts of ground. The natives care little about the species, nor do they consider which is best suited for the worms; suffice it to say, they follow the customs of their forefathers, and that satisfies them; they, however, bestow much labour on the cultivation, and from well managed lands, get several extraordinarily large crops of leaf during the year; it is cut every time close to the ground, and after a little hoeing it springs up again most rapidly. The leaves are cut into small pieces for the very young worms, but after that stems and all are given just as they come from the field. As far as I can judge of the mulberry, it is quite as good for feeding worms and producing silk as the large tree mulberry of Europe. Certainly, the French and Italian worms I fed on it gave cocoons quite as good, or even better, than the specimens that accompanied the eggs. Mulberry is very expensive, and the natives are prone to half feed and stint their worms in consequence, to the great injury, of course, of the cocoon. It is sufficient to them if they have quantity; they have little regard for goodness of quality in any thing.

In the selection of eggs, there is a great choice in India as to the period for incubation, but as the cocoons are alike in every district nearly, there is but little choice as to quality. In one part or other of Bengal worms are spinning nearly every day in the year, but in the rains fewer worms are reared from the lower lands than at any other period, partly because the mulberry is frequently subject to inundation, and partly from the rice crops at this season demanding more attention. At this present moment, 15th September, 1856, most of the mulberry in Bengal, and very many of the filatures also, are some feet under water. The inundation begins to recede in September, and by the end of October, the mulberry is cut and thrown away, and the lands in a forward state of cultivation. Early in November the majority of the rearers procure the cocoons, from which they get the seed for the November bund, the largest we have in the year. Eggs are not sold here as in Europe; seed cocoons are sold instead; the rearers pair the moths and manage them as they like,—they have no fixed system. When seed cocoons are dear, the good and bad are all equal in their estimation; they never sort them; they pay high for them, and cannot afford to lose any—such is their reasoning. Rearing-houses in Bengal are of mud or mat walls, and straw roof; they are generally very small, and, notwithstanding the great heat, have no windows or ventilators, or any other means of lighting the room, except a single fine lattice-screened doorway; they are alike indifferent to light or temperature, to light particularly, and they have some reason for this, for without screens of lattice net work, the flies would enter and destroy every worm in two or three days; even now, millions are destroyed yearly by the flies entering the room at feeding time, and many a batch of apparently good cocoons over night have been found destroyed in the morning by maggots coming out of them from fly blows on the worms before spinning. In cold weather I have known fires used by a few at the doors of their rearing-houses, but very rarely, and the good is questionable for such unventilated buildings. The fluctuations of temperature in Bengal are considerable during the year, and even in the 24 hours frequently as much as 20°; no attempt is made to equalise it in the rearing-houses, which are crammed with worms and necessarily close and offensive; our worms, therefore, passing through all these disadvantages at once prove their hardy nature. From worms generally indifferently fed, and reared in masses, in close, unventilated, and unhealthy houses, you cannot expect the best cocoons, but from the very few independent and most careful rearers, we do sometimes get very fair quality, from 15 lbs. of which, or about 9,500 cocoons, you may reel 1 lb. of very good silk; but every batch of cocoons varies so much in quality it is impossible to fix an average; the rearers are generally very poor people, and the larger portion of them rarely produce over 100 lbs. of cocoons each bund; many even less, and they too often exceed their means and stint their worms in accomplishing this. The tendency of the larger rearers is the same way; they rarely calculate their means, and attempt to rear a larger quantity than they have either space or food for, and satisfy themselves with quantity rather than quality; barring these few exceptions, the majority of silk rearers are in the hands of money lenders, who charge from 30 to 40 per cent. for the accommodation, which would absorb all the profits, if instead of employing their families, they had to hire labour; few or none of them, as you may suppose, reel off their own cocoons, and as they have no means to bear the loss, should any arise from attempts to improve upon the present system of rearing, they do not trouble themselves about it, and if we (Europeans) desire to see any improvement in the cocoons, we must bestir ourselves to effect it, and when the extra profit is palpable to the natives, they will doubtless come in and reap it. With cocoons, such as we now have, and treated as they now are, we cannot reel a better silk than I have produced, my best having already reached 35s. 6d. per lb. I have seen our cocoons reeled at a first-rate filature in France, and a better thread was not obtained there than we can command here. Our operatives are not at all inferior in ability, but they are not half so tractable or careful, and in this is our greatest misfortune, and being a national failing, it is most difficult to surmount; the rich native reelers encourage it; their great aim, as in all other things, is the largest quantity for the smallest price; they have no regard or estimation for quality, and the cocoons from which I get barely 1 lb. of silk they would get 1½ at least, and at much less expense for reeling. There are so few Europeans in Calcutta who know any thing of silk, that the natives find no difficulty in selling their trash at profitable prices, and are consequently formidable competitors with us for cocoons, and create opposition from the operatives, who would far rather take employment where they can reel carelessly than come to our better regulated establishments, where strict attention is demanded from them; however, we cannot complain of the native filatures; if manufacturers at home will buy their trash at profitable prices to them, they are quite right in attempting no improvements.

The general treatment of cocoons in this country before reeling them is also bad in the extreme. They are usually sunned till they are as dry as chips, then baked and sunned again, the gum undergoing baneful changes; the colour becomes faded, the fibre reduced in strength, elasticity destroyed, and the worms so dried up as to have no weight to keep down the cocoon at the time of reeling, and the thread consequently comes off less clean than it might; and as to sorting the cocoons or taking off the floss, that is quite neglected, it would reduce the produce; this practice has been handed down from generation to generation, and I have had the greatest difficulty in altering it in the Surdah filatures, and other Europeans I fancy have found the same difficulty with their establishments. Europeans never rear cocoons in Bengal; this department is entirely confined to the natives, and we are obliged to purchase them through middle-men, who go from house to house for the purpose.

DISCUSSION.

The CHAIRMAN said that the paper just read was not only valuable in itself, from the evidence it afforded of the capacity of that great country, India, to produce the best raw silk, when scientific and careful attention was given to its culture, but there were circumstances operating at the present moment which invested it with additional importance. The failure, to a large extent, during the last year or two, of the silk crops of Italy and France, and the impending interruption to commercial enterprise with China, rendered the discovery or application of any processes by which silk of a similar quality might be so improved as to make up for those deficient supplies, a matter of great interest. Since the introduction of comparative free trade in 1846, and even on its partial introduction so far back as 1826, the demand for silk goods had become so extensive, both abroad and at home, that the ordinary supplies of the raw material had hardly kept pace with it. Hence efforts had been made in British Guiana, particularly in Demerara, and also in some of the West India islands, to cultivate its growth, and he (the chairman) was encouraged to hope, from private sources of information, that they would not be wholly unsuccessful. Indeed, there seemed to be a prospect of other important manufactures receiving some of their raw materials from these colonies, as flax, &c. He had observed that day, that amongst the subjects for discussion during this session in the House of Commons there was a notice of a motion having special reference to this subject. An industry which involved probably not less than fifty millions in factories, mills, and plant generally—from six to eight millions annually in material and labour, and which gave employment to more than a million persons, deserved every encouragement. The statistics on these points had never yet, to his knowledge, been supplied, and these statements could only therefore be taken approximately. The chairman concluded by inviting discussion on the paper.

Mr. FRANCIS BENNOCH rose and said—In the first place he thought the Council had exercised a wise discretion in bringing forward this paper on the present occasion; because, probably, no subject could have been introduced, which in itself possessed inherently so deep an interest to the commercial world at the present juncture as that of the cultivation of silk. When they remembered the large trade that was conducted in this article—when they knew, as had been stated by the chairman, the large number of people who were dependent for a livelihood upon its various processes of manufacture in this country, they could not fail to see its importance. He found from the number of bales of silk introduced into this country last year, that the value of the raw material from all parts could not have been less than eight millions sterling. Eight millions of money for the raw material was a very large sum, and the cost of the labour added to that would show the enormous interests involved. They had heard how Mr. Bashford had cultivated the silkworm and endeavoured to improve it. He had, unfortunately, to a large extent, as he had acknowledged, failed in his endeavours; nevertheless, he (Mr. Bennoch) had no doubt whatever, that the facts brought forward in this paper would probably incite naturalists to devote their attention to the subject, and thus lead to the introduction of a new variety of worm, and a superior quality of East Indian silk. It was somewhat singular, nevertheless, that although private enterprise had been most active in our Indian empire during the last 20 years, the production of silk and the imports of silk into this country from that part of the British possessions, instead of increasing had actually diminished, and were less than they were six-and-twenty years ago. In the year 1830 the quantity of Bengal silk introduced into this country was 8726 bales; he found also that the quantity had gone on, sometimes diminishing, sometimes increasing, until from 1830 to 1837 the quantity had gone back to what it was in 1830; there was, during that period, considerable variation in the quantity of silk imported from India. In 1844, twelve years ago, we imported the large number of 11,000 bales, whilst in 1848 we imported only 4924 bales; but the quantity of silk received from Bengal during the last year was 13,839 bales, while in the year before, in 1855, it was only 8228 bales, or less than it was in 1830. This was not particularly encouraging; and it was clear that there was not that increase in the cultivation of silk in the East Indies which there ought to have been, considering the continually increasing demand throughout all Europe. But it was consolatory to find that the inhabitants of the Celestial Empire, who regarded the people of European nations as utter barbarians, were fortunately able to supply the wants of this country, although we, with our various dependencies, had done but little towards increasing the supply. He found that in 1830 the quantity of China silk imported into this country was only 4842 bales, or very little more than half the quantity imported from India, whilst last year the quantity of silk imported from China was 58,551 bales. He had prepared a table* shewing the amount of imports of silk, all the details of which, however, he would not trouble them with now. It presented facts which he thought would startle even the author of this paper. They found that although they had not materially increased the quantity of silk from Bengal, yet that the quantity from almost every other silk-producing country had very considerably increased. From Persia, 455 bales were imported in 1830, and the quantity since that time had varied in proportion to the probabilities of profit upon the importation of that article into the European markets; but the average importation of Persian silk since 1836 had risen somewhere between 2000 and 2500 bales per annum. From Broussa the quantity of silk had been small until within the last 4 or 5 years, and here was a point to which some attention ought to be devoted. Up to within the last four or five years the Broussa silk ranked in the market as equal to the best Bengal samples, but not equal to the China; but the Greeks, who sometimes seemed to teach us commercial lessons, had taken an opportunity of testing the quality of the Broussa fibre; and having applied the known improvements to the reeling of the silk, had brought a quality into the market which ranked second only to the Italian. They had imported the cocoons from the country where they were produced, and had them reeled in Italy, or else had transferred from Italy the machinery for reeling the cocoons; and the result had been, that they had produced an article which competed successfully with the Italian qualities. Although they had a return of only the small quantity of 143 bales of Broussa silk imported, there was no doubt that a large quantity of silk had been introduced under another name, which had ranked as Italian silk. No doubt the same principle applied in Bengal, as suggested by Mr. Bashford, would in the course of time, give us from our own possessions, a quality of silk that would compete successfully with any of the samples introduced into the European markets; and the fact became doubly interesting in connection with the large falling off that had lately taken place in the supply of silk in Europe. It had been calculated, that during the last year they had not received from Italy and France, taken together, more than half an average crop of silk, if so much—some had put it only at one-third—so that the demand for the finer qualities of silk for continental use was beyond the produce; and the French manufacturers who excelled in their silk fabrics, had discovered at last that there was something in the character and quality of the China silks imported into this country, and also in Bengal silks, which might tend to keep up the supply which unfortunately amongst themselves, had diminished so greatly. Nay, more, he believed by attention to the manner of getting up the silks it was probable that the quality imported would be so good as to diminish the disparity which had hitherto existed between Italian and French silks and those from Bengal and China. There was also another fact in connection with the falling off in the supply of silks in the European markets, the causes of which had been very frequently discussed. A well-written article—a condensation of almost all that is known upon this subject, appeared some six weeks ago in one of the metropolitan newspapers, which he thought in part solved the problem. It was a curious fact,—but not curious in reality,—that the silkworm would follow the ordinary laws of nature; over-indulgence, over-feeding, did not always produce the healthiest frame and constitution. A man who ate and drank to excess, probably would not be so strong or so healthy a man as one who ate and drank moderately; and who took abundant exercise. This principle had been found to apply to the cultivation of the silkworm. When the creature depended for its food upon the hardy mulberry plant of Italy it produced a good quality of silk, far superior to what is now produced. At the time to which he was referring, one ounce of eggs properly cultivated and fed in the usual manner by the peasants, produced 140 pounds of silk, but ultimately those connected with the culture of the silkworm became divided into two classes; one class being the growers of the mulberry leaf, and the other class the breeders of the silkworm. It became important to the mulberry grower, to produce as many leaves as he could to sell to the breeders of the silkworm. They therefore transplanted the hardy mountain mulberry plant into the plains, and, by richly manuring, produced an immense quantity of leaves; but whilst they increased the crop of mulberry leaves, they did not increase the crop of silk; there was a large quantity of matter, without a proportionate increase of fibre. The result was, instead of one ounce of eggs producing 140 lbs. of silk, the produce gradually diminished to 100 lbs., 80 lbs., 50 lbs., and 30 lbs., and last year the average from one ounce of eggs was only 14 lbs., instead of 140 lbs. within the last five-and-twenty years. Here then was a fact which demanded attention, because, not only was the quantity of the silk diminished, but the quality greatly deteriorated. As were the leaves so must the silk be. The coarse and bloated leaves compelled the worms to produce a coarse, irregular, and unhealthy fibre. Those were a few facts which he thought worth dwelling upon in a meeting like this, because they found both the quality and the quantity of the silk diminished. The fact was, the growers of the leaves and the breeders of the worms, instead of having one common interest together, had a divided interest, and unfortunately the grower of the leaves—the agriculturist—had become the dictator to those who bred the worms. The article to which he before alluded entered upon the subject in a truly philosophical manner, and would form a useful accompaniment to the highly practical and valuable contribution of Mr. Bashford. The fact that as a nation we are scarcely doing anything with regard to the cultivation of silk in India, and the knowledge that the yield of silk was diminished in consequence of a grasping policy, based on cupidity, all these things would probably suggest to the mind of some enterprising man the advantages he would derive from introducing into our Indian empire an entirely new and improved system with regard to the

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* IMPORTS OF SILK.

China Bales.	Bengal Bales.	Persian Bales.	Broussa Bales.	Italian Bales.	Total.	Date.
4,842	8,726	455	2,384	6,334	22,741	1830
5,053	7,475	1,569	1,703	6,564	22,364	1831
8,337	6,556	729	1,338	4,605	21,565	1832
5,884	5,169	729	1,737	6,260	19,779	1833
9,531	6,256	2,120	1,382	3,533	22,822	1834
7,858	6,909	2,128	2,703	5,665	25,263	1835
13,035	8,099	2,016	3,172	5,791	32,113	1836
18,429	8,752	2,330	915	3,232	33,658	1837
6,473	7,906	998	2,470	5,221	23,008	1838
3,708	9,545	2,550	2,162	5,656	23,621	1839
3,162	7,409	2,642	3,179	7,117	23,509	1840
3,727	6,744	2,981	2,653	5,199	22,204	1841
1,951	8,866	1,306	3,598	7,612	23,333	1842
2,651	8,086	1,700	2,761	6,710	21,908	1843
3,782	11,505	3,303	3,027	6,166	27,783	1844
11,358	12,031	198	2,071	5,703	31,361	1845
20,270	8,835	2,210	1,509	4,182	37,006	1846
22,379	7,292	825	1,228	3,740	35,464	1847
23,692	4,924	1,389	1,439	7,439	38,883	1848
21,422	10,090	1,085	1,162	5,830	39,589	1849
21,008	10,295	4,259	2,339	3,712	41,613	1850
23,109	3,811	3,020	1,123	3,200	39,263	1851
28,704	11,684	3,032	1,503	2,717	47,640	1852
35,563	9,026	5,824	630	4,600	55,643	1853
60,319	9,345	1,678	154	4,306	75,802	1854
52,210	8,228	1,530	250	2,875	65,093	1855
58,551	13,839	1,858	143	2,784	77,175	1856

production of silk. Although they could not but congratulate themselves upon receiving so valuable a contribution to the information which they were in the habit of annually receiving in this Society in the paper communicated by Mr. Bashford, yet he (Mr. Bennoch) thought there were some points connected with this subject which it would be well to explain, and probably Mr. Bashford might be induced, on a future occasion, to supply further details with which they were at present unacquainted. The author of the paper had given some numbers and weights, but these were difficult to deal with. Had he told them the number of pounds of cocoons that it took to produce a pound of silk, they would then have had a basis of calculation by which they could have compared his plan with others, and the results as compared with those in Italy and France. The quantity of cocoons to produce one pound of silk was found to vary, according to locality, from 4½ to 5 lbs. of cocoons to the pound of silk in that condition to be fit for the hands of the throwster, which was the preliminary process prior to its being put into the hands of the manufacturer for weaving into the various fabrics. Another point was the great difficulty the author of the paper had met with in the ignorance, prejudice, and stupidity of the natives. Instead of doing all they could to assist him in his endeavours to improve the quality of the silk in India, they were satisfied with the coarsest products so long as they obtained a profit. It was difficult to upset their old plans; therefore it was important that the East Indian Government, or an association of individuals, should initiate a movement for the improvement of the silk cultivation in that important part of our possessions, and do for the silk trade of this country what the Manchester manufactures had done with regard to cotton, namely, when they found the supplies falling off in one quarter, to try to discover other and fresh sources of supply of the raw material which formed the basis of their great staple manufacture, independently of all foreign ones. The world itself was the great field of commercial operation. One country, from natural circumstances or resources, would produce a better commodity than another country, whilst on the other hand this country would produce articles better and cheaper than other countries, thus creating a free interchange of commodities. If they discovered that the supply of silk was diminishing, it behoved them to look a-head for fresh sources of supply, so that they might not have their mills standing still and their operatives unimployed and starving for want of material. Such being the case, he thought the large manufacturers ought to associate themselves together for that great purpose. If it were not for an unhealthy principle of competition—association for such a purpose would bring about the most beneficial results. It was too much the object in business to grow rich as fast as they could; it was an amiable weakness, no doubt; but, nevertheless, there were some principles of national honour which ought to rise superior to our individual interests; and if they could, by a combination such as he had suggested, carry out the important objects in view, he knew of no question that demanded their attention so much as the proper cultivation of the silkworm, and the production of a better supply of that valuable material. Arising out of the great diminution of the supplies from other quarters, was no doubt the increase of the supply received from the Chinese. It was certain that but for the energy and industry of these people there would not be a supply of silk enough for half the manufacturers of England. The supply had been rapid, and had come at the very moment when it was most wanted; so recently as 1851 the quantity of silk introduced into this country from China was only 23,000 bales, whereas they found in 1853 it was 35,000 bales; in 1854, 60,000 bales; in 1855 it was 52,000 bales: and in 1856 it was 58,000 bales. Where would the silk manufacturers of England have been but for the energy, industry, and perseverance of the Chinese people, whom they were accustomed to look upon with a sort of contempt. In conclusion, he begged to express his acknowledgments to Mr. Bashford for the information he had communicated, with a hope that further details would be afforded at a future opportunity.

Mr. Leckie (of the firm of Durant and Co.) said, having heard the paper of Mr. Bashford he could endorse most of the statements contained in it. He had known the author for many years, and for the last five or six years the whole, or nearly the whole, of his produce of silk had passed through his (Mr. Leckie's) hands; and he could say that during that period it had been an improving production. During the lifetime of Mr. Watson that gentleman went to great expense in making experiments with a view to improve the quality of silk produced in India. He took out with him workmen from France and Italy, and also the most improved machinery for reeling. He erected a steam factory, and spent a fortune in trying to improve the system of reeling, but he found, as Mr. Bashford had observed, the natives so obstinate and prejudiced that he was compelled to give it up. He looked upon this as one of the great causes of the non-improvement of the silk production of India. Added to this was the unhealthy character of the climate in the low lands to European constitutions, which compelled most of the reelers to return to their own country for the sake of their health. With reference to the production of silk in India he thought the figures of Mr. Bennoch did not exactly represent the actual state of the case. With regard to the year 1848, which was referred to as being one in which the importations of silk were very small, it was to be borne in mind that that was the season of the French revolution, during which the great silk magazines were shut up. He might remark that at the time when French organzine was fetching 46s. per pound, China silk was scarcely saleable at from 18s. 6d. to 20s. Bengal silk was then worth from 5s. 6d. to 6s. per pound only, but it now found buyers at from 15s. to 15s. 6d. In 1848 the first of the November bund of Bengal silk sold at 12s. 9d. to 13s. That silk, if they had it now, would be worth 35s. The low price which Bengal silk formerly produced in the European market might be placed amongst the reasons for the small importation of that article. Another fact was, that a great portion of the silk produced in India was used in fabrics there, and this was found to pay the producers better than exporting it at 8s. or 9s. per pound. A great quantity of the silk was manufactured into corahs and sashes for the ladies, and it was rarely that even the poorest of the natives had not some article of silk upon them; besides which they supplied the Arabs of the Persian Gulf and the Straits. With regard to the statement that Mr. Bashford's silks realised many shillings per pound more than other samples from the same district, he (Mr. Leckie) must take exception to it. At the most he (Mr. Leckie) could make it only many pence more. For example, his best samples were worth only about 1s. 6d. per pound more than the other descriptions, although Mr. Bashford's was *par excellence* the silk of Bengal. One of the reasons, he thought, for the smaller importations of 1848 was, that the China silk was more easily worked than most other descriptions, and for that reason was preferred by the manufacturers over the silk of India. With regard to the productions of Broussa, he thought Mr. Bennoch was in error in awarding the meed of praise he had done to the Greeks. He believed only two filatures were owned by the Greeks there, who exported their cocoons to Marseilles and Trieste, which were afterwards very much used in the manufacture of lace at Nottingham. The filatures of which he spoke were termed *Broussa à l'Italienne*, and perhaps few people could tell the difference. The Greeks did not originate the improved system of reeling, but a certain pasha, in 1851. The Greeks, generally speaking, were a people fonder of trafficking than of manufacturing—they liked to "buy and sell and get gain." They were excellent merchants, and we were very much indebted to them. With regard to improving the silk cultivation of India, he believed it to be morally impossible whilst the natives remained so obstinate and so wedded to their old prejudices. They could not get them to reel the silk regularly; sometimes they commenced with from six to twelve or fifteen cocoons going, then a number of ends would become broken—the winding still kept on, and again the broken ends were taken up, and altogether the reel produced was of a most irregular character—a state of things which could not be obviated except by a system of supervision, to which they were at present obstinately averse.

Mr. John Chadwick having been called on by the Chairman, said that he knew nothing of the culture of silk in India, but had listened with interest to the paper which had been read. He said that if the inferiority in the reeling of India could not be overcome, in consequence of the indolence of the natives, there was no reason why the cocoons should not be imported and reeled both in this country and on the continent; for though we cannot give a nerve to the thread which nature has denied it, we can reel an even regular thread instead of an uneven and foul one; but it was, perhaps, of more importance to import the cocoons of China, because they would make a silk equal in fineness, in nerve, and in all other features, to any silk produced. He had himself imported cocoons from China, part of which had been reeled in Manchester and part in France, and in both cases organzine, equal to that of French growth, had been produced. He thought there was no reason whatever why, in the course of time, this country should not reel the silk for its own manufactures, and thus obtain the size of thread best adapted for its requirements. In allusion to a remark made by the Chairman, he said that the policy of free-trade had not yet been applied to the silk manufacture of this country. Sir Robert Peel, in 1846, removed the duty from foreign thrown silk, but retained the highest amount of duty that could practically be enforced on foreign manufactured goods, and this protection (as it was falsely called) was still retained, though the odium now rested with the Government for not removing it, and not with the manufacturers, many of whom had prayed for its removal.

Mr. G. F. Wilson, F.R.S., remarked that Mr. Bennoch had drawn attention to the degeneracy of the cultivation of the mulberry leaf. About a year ago, in the Society's Journal, (if he recollected rightly,) there was a notice of some experiments, in which the leaves of the castor-oil plant were substituted for those of the mulberry. He would ask, whether any further reports had been made upon that subject?

The Secretary stated that the experiments with the leaves of the castor-oil plant had not been tried with the ordinary silkworm, but with the *Bombyx cynthia*, a totally different species of worm. More experiments were tried by Col. Sir Wm. Reid, in Malta, and had completely failed.

Mr. Leckie.—It is a worm grown in Assam and the hill country.

Mr. E. C. Tufnell stated that the experiments had completely failed in Malta, in the second crop, but had been attended with some success in Demerara.

Mr. J. Vavasseur said, though Mr. Bashford's experiments to improve the silk-worm of Bengal had failed, his efforts to improve the reeling of their produce had been eminently successful. The superiority of his own and other European filatures over native-reeled silk proved the possibility, by the introduction of European capital and management, of improving the whole of the silk produce of Bengal. The fact that the native growers were able to give from 30 to 40 per cent. for the use of money, proved that there was plenty of scope for profitable investment. It must be borne in mind that the superiority in the European filatures of Bengal was the result of care in the reeling only, not of any improvement in the rearing of the worms. Mr. Bashford said they were half starved, were kept in dark, close, unventilated huts, and that no care was used in selecting the best cocoons for seed. This neglect of all the conditions of the silk worm's health resulted in just what might be expected, a very wretched thread. To produce a good thread for the manufacturer's use, it was indispensable that due care should be taken in respect to—1. The rearing of the worms; 2. The reeling of the cocoons; 3. The throwing. As to this last point, there was not much room for improvement; he (Mr. Vavasseur) would therefore say nothing about that, but in Asiatic silk there was much to be done, both as regarded the rearing the worms and reeling the cocoons. By Mr. Bashford's persevering care in reeling he had improved his silk till it had reached the highest rank among Bengals, but his improvements were brought to a stop, because the cocoon itself was not improved, the natives not taking the necessary care in rearing the silk worm. In China this position was reversed, the worm was very good, and was evidently reared with judgment and attention, so that a superior cocoon was produced, but the best result was not obtained, because the silk was carelessly reeled, for at present Europeans, not being allowed to live in the interior, could not improve the reeling. There was no sufficient motive to induce the natives, in Bengal and China, to improve either the rearing of the worms or the reeling, for all their silk was so eagerly bought at high prices, that it could not be expected that they would put themselves to any trouble to improve an article which in its present condition was so profitable. This state of the market was brought about by the failure of the European crop of 1856, but should the next few years produce the average yield in Europe, the former relative position of Asiatic and European silk would not be maintained, and for this reason,—before the failure of the crop in 1856, Asiatic silk was comparatively little known or used on the continent, but it had now been forced into use there to a great extent. If, therefore, the European crop in future years returned to its annual yield, Asiatic silk would still be favoured with a large consumption on the continent, and as a consequence its average range of price would be higher than before 1856, and European silk would be relatively depressed. If this view were correct, though the present state of the market might be considered exceptional, there was every probability of Asiatic silk commanding better prices than formerly, without any improvement in the article itself. On this, therefore, he (Mr. Vavasseur) based the conclusion that there would be no motive to induce the Chinese or Bengalese to make any alteration in their silk culture. But though the state of the market did not afford a probability of any improvement being made by the natives themselves, it offered additional inducements for European enterprise and capital. What Mr. Bashford had done for his own filature might be done by others, very much to their own profit. The prospects of the silk market offered the highest inducement for European enterprise to commence and to extend the field of silk culture in countries favourable for its growth. They might be broadly described as contained in a zone extending from about 25° to 45° north latitude. Persia, Syria, Asia Minor, Greece, Turkey, and Spain were all favourable for the growth of silk. But it was hopeless to expect the highest results from the growth of silk in eastern countries without European capital and management.

Mr. Lyell said, two years ago he received a letter from Dr. Sutherland, from Port Natal, with a specimen of silk cultivated there, accompanied by a statement that the mulberry tree in that climate was in full leaf nearly all the year round. The country was dry, and in all respects adapted for the successful cultivation of the silkworm. Dr. Sutherland wished him to obtain an opinion as to the fibre of the sample he forwarded. He submitted it to an Italian, who pronounced it to be very excellent.

He thought it a fact worth mentioning, that in that district of the country, there were great facilities for the production of silk of good qualities, and if they were not acquainted with the treatment of silk, cocoons would be imported and made use of in this country.

Mr. J. Chadwick said, he had also received samples of silk from Port Natal, but it was so imperfectly reeled that he could make nothing of it. He had also received samples of silk grown in Australia, but it was merely by way of experiment.

After a few words from Mr. Varley,

The Chairman, in proposing a vote of thanks to Mr. Bashford, took occasion to pass in review some of the extraneous subjects which had been introduced by some of the speakers; but as he had himself set the example by an allusion to the results of the approximation to free trade, since 1846, as far as regarded silk goods, he was hardly in a position to complain of them. Only on one point would it be necessary to explain himself. He (the chairman) in his allusion to the relaxation in 1826, had not, as Mr. Chadwick appeared to think, quoted that year as the introduction of free trade into that particular manufacture, but rather as the dawn of it, for the duty then imposed of thirty per cent. *ad valorem* was anything but the realisation of that policy. It was only an improvement of what had previously obtained, namely, total prohibition.

The following letter has been received by the Secretary since the reading of the paper:—

Sir,—I am of opinion that Mr. Bashford merits thanks from the country, and especially from the silk trade, for his interesting and valuable attempts to improve the silk yieldings of Bengal.

Being much interested in the development of silk reeling in this country, I beg to offer a few remarks upon Mr. Bashford's paper.

I have reeled on my patent machinery Bengal cocoons, and have produced silk therefrom of a quality very superior to that reeled in India. Unfortunately the cocoons are so small that, excepting at a very low cost, a preference would be given for the European by reason of their more abundant yield.

Although Mr. Bashford has not yet realised his expectations, he has evidently made considerable progress, and has demonstrated that the European silkworm will thrive well in India.

I am inclined to suppose that one cause of the degeneration and weakness of the Bengal worm is occasioned by the removal of its species four times yearly. The European silkworm reproduces itself once only in the year, and is evidently much stronger than the Bengal, and yields four times as much silk. I would, therefore, suggest to Mr. Bashford to retard (by artificial means) the incubation of the eggs, so that twelve months shall elapse before they are hatched, and as the mulberry will produce four crops of food, so he might have March silk from the previous March eggs, &c., &c. It appears beneficial for the embryo worm to have twelve months for maturity. Nature will not encourage any violation of her laws. You may improve the black man, but you cannot make him white.

The cold weather crop in Bengal apparently yields the finest silk—this result agrees with the products of Europe. The finer qualities of silk come from the mountainous districts. I concur with Mr. Bashford in his estimation of China cocoons, having reeled therefrom silk superior to any French or Italian. I have for the past three years been prosecuting at my works here practical experiments in silk reeling, and have succeeded in rendering the operation more simple and easy than any process of thread making in other fibrous manufactures.

This new industry will shortly enter upon its development. In due time I expect we shall receive cocoons from the various silk countries, and thus possess, as in the cotton manufacture, our raw material in its primitive form—when our silk manufacturers will not be dependent upon the very imperfectly reeled silk with which they are at present supplied.—I am, &c.,

THOS. DICKINS.

Silk Works, Middleton, Feb. 4, 1857.

The following is the article from the *Daily News* on the Silk Crop referred to by Mr. Bennoch:—

"The failure of the silk crop is not a mere local calamity, nor are its collateral evils confined solely to those engaged in silk manufacture, for it has largely contributed to the monetary derangement from which England and France are but now emerging. It becomes, therefore, a question of general interest to ascertain the true causes of this enormous falling off in production; to inquire whether it may be considered as a merely temporary and accidental calamity, or whether, like the disease in the potato and the vine, its recurrence or continuance is to be apprehended, and if so, what steps should be taken to arrest its progress. The distress it has created in those districts where no inconsiderable proportion of the population derived its chief means of subsistence from the various occupations connected with rearing silkworms and preparing the silk for the market, and the social peril arising from any serious check to the industry of Lyons, have given the subject an importance in France which has already induced those more immediately interested in the question to examine it in all its details. These inquiries are not yet at an end, nor have both sides yet been fully heard. So much progress, however, has been made in the investigation, that we may safely proceed to lay before our readers the following conclusions as those which appear to be most generally accepted in explanation of the deficient yield of silk in France.

"Until the early part of the present century, the rearing of silkworms was carried on by '*magnaniers*,' or silkworm breeders, whose establishments consisted chiefly of themselves and their families, conducting their operations in their ordinary dwelling-houses. The quantity of eggs on which they operated rarely exceeded two or three ounces, and the yield of cocoons was usually about 140 lbs. to the ounce of eggs. The caterpillars were fed on the leaf of mulberry trees, growing almost in a wild state. These trees, preferring a poor calcareous soil, were left nearly in their natural condition, rarely manured, and suffered to grow to their full height, producing a not very abundant crop of leaves of a smaller size and lighter colour than those of the cultivated mulberry, but containing a large amount of nutritive matter. The result of this was a silk of a very superior quality, both for toughness and elasticity, but somewhat high in price. The *magnanier* was rarely the proprietor of the mulberry trees, which were grown as a source of profit by large agricultural proprietors, who sold the leaves to the silkworm feeders. These latter chiefly depended on their own moths for the supply of eggs for the next year's broods, rarely purchasing eggs, unless from neighbouring producers, and selecting, for continuing the race, the largest and finest cocoons; and, when the moths were produced, preserving those only whose strength and physical conformation were such as experience had shown to be the best fitted for ensuring a healthy and hardy race of caterpillars. The first change made in the system was on the part of the proprietors of the mulberry trees, who directed their attention to the best mode of increasing the crop of leaves. This was effected by planting the trees in a richer soil, and liberally manuring. The trees, instead of being left to their natural growth, were topped, and a denser mass of foilage was soon produced, the leaves being larger, thicker, and more abundant than before, but containing a much larger proportion of fluid, and having, consequently, a far less concentrated amount of nutriment in a given weight of leaves.

The effect of this apparently improved culture soon declared itself. The silkworms fed on these leaves were less healthy, the crop of cocoons less certain, and the quality of the silk frequently deteriorated. The yield of cocoons fell off from 140 pounds to 100 pounds, then to 80 pounds, and even lower, and finally the small breeders and producers abandoned their occupations, in many instances, as too precarious or unremunerative. The profits of the owners of the mulberry plantations rapidly diminished in consequence, and the system of uniting the occupations of breeder and mulberry grower was adopted, the "*magnaneries*" being at the same time mounted on a much larger scale. Instead of two or three ounces of eggs being operated on, from twenty to fifty was the usual quantity, and the eggs became a regular article of merchandise, the smaller breeders finding it more profitable to wind off all their cocoons than to reserve them as the nucleus of future broods. The ratio of caterpillars to the number of eggs in the meantime steadily diminished, as did also the yield of cocoons, the silkworms having become more liable to epidemic diseases, and less able to resist those atmospheric influences to which they were at all times so susceptible. In the larger establishments these atmospheric variations were sought to be counteracted by artificial heat, which, while it accelerated the changes through which the caterpillars passed, reduced the cost of producing the silk. But it was found that, in spite of improved modes of ventilation and the utmost attention to cleanliness, the liability of the silkworms to disease and the number of eggs which were worthless were on the increase. The yield of cocoons fell from the average of 140 pounds to the ounce of eggs under the old system, to 50, and even 30 pounds; and this year, where it has not utterly failed, it has rarely exceeded 14 pounds. The disease known as the "gattine" has become exceedingly common among the silkworms; the breed is evidently generally enfeebled, and the eggs brought to market are of so doubtful a quality that the small breeders fear to purchase, and are preparing to abandon the rearing of silkworms altogether.

"The evil, therefore, is attributed to the over culture of the mulberry tree, which has increased the quantity of leaves at a sacrifice of quality; and in the absence of proper care in selecting the moths destined to produce the eggs for ensuing operations. It has been found, moreover, that the yield of cocoons diminishes in proportion to the quantity of caterpillars reared in the same establishment, those *magnaneries* operating on from one to ten ounces of eggs yielding a proportionally larger return than those in which from ten to twenty ounces are undertaken. The remedy proposed is, that the present system of over-stimulating the mulberry trees should be abandoned, and that the utmost care should be taken in selecting moths in the most perfect conditions of health and physical conformation, otherwise it is to be feared that, from the constant intermixture of the still vigorous races with those affected by the artificial system of diet and breeding, the silkworm in France will become universally enfeebled, the quality of the silk permanently deteriorated, and its production, as a branch of profitable industry, almost annihilated.

"Unfortunately, however, the growth of the evil has been gradual, extending over the whole of the present century. The value of agricultural property fitted for the present mode of cultivating the mulberry has been fixed on the supposition that it was a permanent branch of industry, and a return to the old system would, it is feared, seriously enhance the price of silk, and therefore diminish its consumption. A very large number of persons are engaged in the various processes of preparing the silk for the market, and it is consequently of the highest importance that the causes which have deteriorated the race of silkworms in France should be thoroughly investigated, and that the remedy should be so applied as to interfere as little as possible with existing interests. The rapid progress which the spread of epidemics among the caterpillars has of late made renders the solution of these questions a matter of urgent necessity; and we earnestly invite the attention of naturalists and commercial men to a subject in which we, as well as the population of the silk districts of Southern Europe, are so largely interested."

Samples of Bengal silk were shown by Henry W. Eaton, Esq., and samples of silk reeled in this country and in France from China cocoons were shown by John Chadwick, Esq.

The Secretary announced that on Wednesday next a paper, by W. Bridges Adams, "On the Application of Railways for Horse Traffic in the Streets and Environs of London," would be read.

AMERICAN PATENT LAW.

The following is extracted from the charge of his Honour Judge Nelson to the Jury, in the case of Sickels v. Borden, lately tried in the Circuit Court of the United States, in the city of New York. The law, as thus laid down by the Judge, is in conformity with the decisions of the Supreme Court, and has very important bearings on the rights of Patentees:—

"The only question remaining for the consideration of the jury, is that of damages. There are two modes of arriving at these in the case of an infringement.

"If the patentee has an established price in the market for a patent-right, or what is called his patent-fee, that sum, with the interest, constitutes the measure of damages. If the patentee has not any established price for a patent-fee, then you are to inquire as to the loss or injury which he has sustained by reason of the infringement, and, as stated by the counsel, the profits which the infringer has made by the use of the invention of the plaintiff, may be taken as the measure of damages. Of course the defendant cannot complain of that, because, if in fact he was an infringer, he has been using the property of the plaintiff, and whatever profits he has made out of it, belong in equity to the owner. It is a question here whether or not there has been an established patent-fee for this improvement proved by the evidence. There is evidence that the patentee sold one of his patent-rights in Philadelphia, for 250 dollars, and that he sold another in Baltimore, for 500 dollars. He sold several rights to the Government, at the rate of 12.50 dollars per cubic foot, which, applied to the Metropolis,* upon the evidence, would amount to 900 dollars. As it respects the 250 dollars and the 500 dollars, you have the explanation of the patentee himself. His object in selling at such prices, he says, was to get the invention into public use, and that he made sacrifices of what he deemed its real value on this account, that the public might see the sucessful working of his improvement. Undoubtedly this circumstance is not peculiar to the plaintiff—this account is perhaps the history of most inventions on their first introduction to public notice and use. It requires effort, influence, and sacrifice on the part of the inventor, to introduce them to the public notice, so that they may acquire the confidence of the community. The public are distrustful of new inventions, and rightfully so: not one out of one hundred issued at the present day is worth, in my judgment, the parchment upon which it is written. It is only now and then a valuable improvement is produced, and it soon becomes the subject of litigation and contest; and even the most meritorious require time, effort, influence, and sacrifice of money, to bring them to the notice of the public. And it is quite proper that these views should be taken into account upon the question of the patent-fee. If the jury are satisfied that it was sold at less than the real value of it, upon the views stated by the patentee, and that sacrifices were made for the sake of introducing it into public use, these considerations should be taken into the account in case of determining the measure of damages by the patent-fee. It is important that the jury should take into account the fact that if they adopt the price of the patent-fee, whatever they may determine that fee to be upon the evidence in the case, it will operate to vest the title of the patent to the extent of its use in the Metropolis throughout its term; and they should state whether they adopt the patent-fee or the profits from the use of the inventions as the measure of damages; for in the former case the title passes, and in the latter case it does not pass, and your verdict will be for a compensation for the use of the invention during the sixty days' use before the suit."

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* The name of the steam vessel on board which the pirated invention was alleged to be used.

The reporter makes the following observation on this part of the charge:—

It will be seen in this case, by studying the law as it is correctly announced by his Honour Judge Nelson, in conformity with the decisions of the Supreme Court, that the "*exclusive right*" of an inventor to make and to *sell* his invention, is held to mean, that any infringer may take it at pleasure, paying for it whatever a jury may say is the price at which the inventor would have sold it to an honest purchaser who recognized his title, and who would pay that price, without the expenses, delay, and vexation of a lawsuit. In this particular case, the verdict of the jury did not work a transfer of the title of Mr. Sickels to the Metropolis, but it was in their power to have done so, as the Court now holds the law, simply by finding a verdict for some price, (say 250 dollars,) and stating that such price was for the patent-fee. If they had found such a verdict, the Court ruled that the title would have passed to the owner of the Metropolis; so that whatever had happened to the *inventor* by the lawsuit, the *infringer* would have got out of any trouble. The "*exclusive right*" to "*vend* to others to be used," an invention, so solemnly "*secured*" by Constitution and by statute to an inventor, therefore means, that a Court and jury may, at *their* discretion, "*vend it to others to be used*," at whatever price they may think fit to fix.

In civilized Europe, the machine which is found to be an infringement of an existing patent, is decreed to be destroyed or confiscated, and the infringer must pay all damage and costs. But here, by the magic of a verdict *against him*, an infringer becomes suddenly transformed from a "pirate" into an honest owner of a patented invention, duly paid for by a few words written in the minutes of some Court, a true copy of which will at any time, when produced, establish his title and prove to the satisfaction of every one but the plundered patentee that the "exclusive right to vend to others to be used," *that* particular invention, is one of the commonest rights in the country, in the "*exclusive*" enjoyment of which any one may share at pleasure. (*Quere.*—Would an infringer be better off by a verdict in his favour?)

Home Correspondence.

TONNAGE AND SHIPPING REGISTRATION AMENDMENT.

Sir,—The cause of "Shipping Registration Amendment," as brought before the Society of Arts by my papers of 16th May, 1845, and 16th January, 1846, having attracted attention and led to many enquiries in further exposition of the views which I individually entertain, and to discussion with reference thereto, I beg the favour of your inserting the enclosed letter which I have addressed to the editor of the *Mechanics' Magazine*, on certain points of discussion which have also been brought forward in the *Journal of the Society of Arts.*

I am, &c.
CHARLES ATHERTON.

Woolwich Dockyard, Feb. 3, 1857.

To the Editor of the Mechanics Magazine.

Sir,—In acknowledgment of your editorial article on "Tonnage and Shipping Registration" in your last number (1747), I am quite satisfied with your new version of the admitted deficiencies of our present system of Shipping Registration as expressed by you in the following terms:—

"What then are the *deficiencies* of the present law on which we are agreed? Of course we acknowledge that the present law does not require the registration of the light or load displacement of a vessel. Does not prescribe a limit of load water line. Does not require the registration of indicated horse-power or any real measure of engine-power equivalent to this. We may further acknowledge, that for scientific purposes, a knowledge of these data may be of the greatest benefit, and we may further admit that it may be worthy of the consideration of a committee appointed by a scientific body of acknowledged authority whether these data can be obtained by legislation or otherwise without any injury to the shipping interest."

I cordially concur in the above your declaration as the editor of the *Mechanics' Magazine*, presuming that by the concluding words, "the shipping interest," you mean the lawful rights of all parties interested in shipping transactions. I observe further, that, notwithstanding your admissions of the deficiencies of our present system of official registration, under the law of 1854, you again advance the often-repeated challenge in support of the sufficiency of the present system, and which I have hitherto declined to notice, because, as I conceive, there ought to be no challenge of intentions. Your often repeated challenge is as follows:—

"The Merchant Shipping Law of 1854 is admirable for the purposes for which it was intended."

Now the foregoing admitted deficiences, as respects the total exclusion of external admeasurements from our present registration establish the following deductions:—

1st. That a vessel of a 100 tons register, and paying fiscal dues as such, may, if it suit the trading interest of parties, be so constructed as to carry 1000 tons weight of cargo. I ask was this anticipated and intended by the framers of the law?

2nd. A merchant may contract with a shipbuilder for a vessel of 1000 tons register, pay the contract price, and find himself the owner of a ship so proportioned and built, with a view to speed and strength, that she will not carry 500 tons weight of cargo within any reasonable limit of load water line; such may be the case; and I ask was this anticipated and intended by the framers of the law?

3rd. As respects the existing reality, every ship, without exception, measured and registered under the law of 1854, of say 100 tons register, is capable of holding 250 tons of goods by measurement, at the usual rate of 40 cubic feet to the ton, and yielding freight on 250 tons though rated for fiscal dues at 100 tons only; hence, with persons who may have occasion to ship goods, and don't know better, fiscal dues to the extent of say five shillings per ton, charged on the ship may be expected to enhance the cost of freight five shillings per ton, and the stipulated rate of freight may be agreed for under this impression, though in reality five shillings per ton on the ship, would be met by two shillings per ton measurement on the cargo. Again, I ask, was this liability to surcharge anticipated and guarded against, or intended, by the framers of the law?—In like manner, and from the same cause, other questionable operations of the law may be cited, all which would be obviated by our shipping registration embracing not only the capacity of ships for holding bulk of cargo, but also their capability for carrying weight of cargo, and a distinctive nomenclature being introduced into our system of registration.

As to the above cited cases, I do not say there would be anything commercially unjustifiable in thus taking advantage of the admitted deficiencies ot our registration; and in late numbers of the *Mechanics' Magazine*, the sentiment has been repeatedly advanced as a moral axiom, that one who can be deluded by any uncertainty in the term "Tonnage," deserves no more protection from parliament, than the simpleton in any other trade, who chooses to buy a "pig in a poke." Again I ask was the propagation of such morality as this anticipated and intended by the framers of the law which regulates our shipping registration.

It is evident that advantage may be taken in each of the various cases of tonnage anomaly above specifically cited, and as respects these possible instances of shipcraft, instead of concurring in your declaration, that "the Merchant Shipping Law of 1854, is admirable for the purposes for which it was intended," permit me to say, that the law is lamentably open to being made use of for the purposes above set forth, and that such purposes, if acted upon, constitute public abuses, which have not been anticipated, guarded against, or intended by the framers of the law, and which cannot be permanently upheld.

I remain, &c.,
CHARLES ATHERTON.

Woolwich Dockyard, Feb. 3.

RAILWAY COLLISIONS.

Sir,—As there is so much loss of life, limb, and property by railway collisions, allow me to suggest a telescopic or compressible truck, to be placed before, and another after, each train, the resisting medium being vulcanized India rubber, with ample space to expand externally and internally on being compressed, which would materially ease, if not wholly prevent any serious accident, at a comparatively trifling cost.

I am, &c.,
G. N. SHORE.

Lyme Regis, Dorset, Jan. 30th, 1857.

Proceedings of Institutions.

Saddleworth.—The twelfth annual meeting of the Mechanics' and Literary Institution took place at Uppermill, 28th ult. Such was the interest of the event, that, several days before the meeting, all the tickets of admission were sold. Amongst those present were J. H. Whitehead, Esq., Southside; Charles J. Buckley, Esq., Holly Ville; Richard Buckley, Esq., Nook; Edward Bottomley, Esq., Greenfield; John Bradbury, Esq., Brownhill; W. K. Schofield, Esq., Heathfields; Samuel Rhodes, Esq., Kirkburton; Ralph Rhodes, Esq., Liverpool; James Platt, Esq., Prospection; Thomas Wood, Esq., Ryefields; William Broadbent, Esq., Harropgreen; James Broadbent, Esq., Carr-house; W. D. Hall, Esq., Diggle Ville; Dr. B. Bradbury, M.D., Dobcross; Robert Hastings, Esq., Dobcross; Dr. Saville, Mossley; Miles Mayall, Esq., Mossley; R. S. Bukley, Esq., Woodend; Ralph T. Bradbury, Esq., Kinders; William Blackburn, Esq., Uppermill; John Shaw, Esq., St. Chads; Thomas Shaw, Esq., St. Chads; Rev. J. Robinson, late of Middlewich; and William H. Robinson, Esq., Marsden. Mr. Lawton, the hon. secretary, read the report, which described the privileges of the institution as consisting of educational classes, circulating and reference library, and reading-room. In the classes are taught—arithmetic, writing, mensuration, grammar, bookkeeping, and geography. The pupils number 59; average attendance. 50. They are in charge of a salaried teacher, who reports them to be diligent in their studies. The library is composed of 1,500 volumes, very few of which have been presented; the average weekly circulation is 82 volumes. The reading-room is well supplied with papers and periodicals of various kinds. The number of members at the end of last December was 153; the average of the year, 152. Of these one pays two guineas annually, 22 one guinea, 15 half a guinea, 103 6s., eight ladies 8s., and three ladies 5s. In addition to these, there are a number of non-paying members, who are sent free by the subscribers of one guinea and upwards, and who enjoy all the privileges of classes, reading-room, and library, the same as other members. About twelve months ago some unknown friend made a donation of £10 to this Institution, on condition that it was spent upon scientific or philosophical instruments, &c. The committee accepted the kind offer, and, in accordance with the wishes of the donor, fitted up and purchased a complete dissolving-view apparatus and microscope, upon the best known plan. The annual income is about £82, including interest from £300, being the balance in hand during the last three years. In concluding this brief report the committee regret that so few, comparatively, of the working-classes take advantage of the privileges of the Institution, which are so numerous and applicable, that whoever is now without a good secular education must in after years, when the want is found, lay the blame upon his own shoulders. The meeting was then addressed by the chairman, Mr. J. B. Robinson, Mr. E. Thornton, Mr. D. Morris, Mr. Frank Curzon (of Huddersfield), Rev. S. Dyson, Mr. James Platt, and other gentlemen.

MEETINGS FOR THE ENSUING WEEK.

Mon. London Inst., 7. Mr. Charles Salaman, "On the History o Music, especially in connection with National Dances."
Architects, 8. I. Mr. C. Fowler, jun., "A Memoir of the late Alexis de Chateauneuf." II. "Some description of the Streets proposed to be formed by the Metropolitan Board of Works." III. "A report to the Council on the Soulages Collection, with reference to recommending its purchase by Her Majesty's Government."
Geographical, 8½. I. Lieut.-General William Monteith, "Notes on the Route from Bushire to Shiraz." II. Col. Sir Henry Rawlinson, "Observations on the Geography of Southern Persia, with reference to the pending Military Operations." III. Lieut.-General Jochmus, "Commentaries on the Battle of Sellasia, &c."
Tues. Royal Inst., 3. Prof. Huxley, "On the Senses."
Syro-Egyptian, 7½. Dr. William Camps, "On the State of Medicine in the Schools of Alexandria and Lesser Asia."
Civil Engineers, 8. Discussion "On the Permanent Way of Railways."
Med. and Chirurg., 8½.
Zoological, 9.
Wed. Literary Fund, 3.
London Institution, 3. Mr. E. W. Brayley, "On Mineralogy and Crystallography."
Society of Arts, 8. Mr. W. Bridges Adams, "On the Application of Railways for Horse Traffic in the Streets and Environs of London.
Graphic, 8.
Microscopical, 8. Anniversary.
Archæological Association, 8½.
Ethnological, 8½.
Thurs. Royal Institution, 3. Prof. Tyndall, "On Sound."
Royal Society Club, 6.
London Institution, 7. Dr. R. E. Grant, "On the Natural History of Extinct Animals."
Antiquaries, 8.
Royal, 8½.
Fri. Astronomical, 3. Anniversary.
Royal Institution, 8½. Mr. T. A. Malone, "On the Application of Light and Electricity to the Production of Engravings—Photogalvanography."
Sat. London Institution, 3. Mr. T. A. Malone, "On Experimen al Physics, chiefly in Relation to Chemistry."
Royal Institution, 3. Prof. Phillips, "On the Origin and Progress of Life on the Globe—Fossil Plants."
Medical, 8.

PARLIAMENTARY REPORTS.

SESSIONAL PRINTED PAPERS.

Delivered during the Vacation, 1856.

Par. No.
316. Railways—Returns.
341. East India—Copies of Treaties, &c., with the Native States of India.

393. Gold (Australia)—Return.
395. Army Prize Money—Account.
296. Transportation—Second Report from Committee.
384. Spirits—Return.
388. Dublin Union Workhouses—Returns.
394. Mr. James Sadleir—Copies of the Informations and Warrant.
343. Masters and Operatives (Equitable Councils of Conciliation)—Report from Committee.
387. Churches and Schools—Return.
369. Ecclesiastical Commission—Third Report from Committee, Evidence, &c.
413. Public Health Act—Returns.
349. Grand Jury Presentments (Ireland)—Abstract of Accounts.
397. London Corporation—Annual Accounts.
403. Burmese War—Return.
454. Private Bills—Return of Capital and Loan.
455. Public Bills—Return.
411. Criminous Clerks—Return.
392. Stamped Postage Envelopes, &c.—Returns.
380. Sound Dues—Report and Minutes of Evidence.
390. Churches—Thirty-sixth Annual Report.
416. National Debt—Return.
429. Municipal Boroughs (Ireland)—Abstract of Statement.
252. Finance Accounts—Classes 1 to 8.
311. Court of Chancery (Ireland) Bills—Report from Committee.
383. Compensations (Ireland)—Return.
394. (1). Mr. James Sadleir—Copies of Informations, &c.
428. Oxford University—Copy of an Ordinance.
39. (7.) Trade and Navigation Accounts (31st July, 1856).
422. Army—Index to Report of the Board of General Officers.
431. Customs Duties (Canada and the West Indies)—Correspondence.
432. British Guiana—Correspondence.
337. Civil Service Superannuation—Report from Committee.
345. Transports—Return.
353. Lunatic Asylums—Abstracts of Accounts.
381. Revenue, &c. (Ireland)—Accounts.
396. Sugar, &c —Return.
398. Registers (Scotland)—Return.
399. Church Leaseholds—Return.
400. Rural Police (Scotland)—Return.
402. Grand Jury Cess Applotment (Ireland)—Return.
405. New Palace at Westminster—Correspondence.
401. Valuation (Scotland)—Return.
412. Election Auditors (Ireland)—Return.
420. Poor Laws—Returns.
423. Barrack Masters (Ireland)—Return.
424. Army—Nominal Return of Lieutenant-Colonels.
426. Library of the House—Report from the Committee.
439. Eliza Canningford—Correspondence.
440. Redundant List (Public Departments)—Return.
448. Sittings of the House—Return.
450. Select Committees—Return.
452. Public Bills—Alphabetical List.
453. Private Bills—Returns.
379. Adulteration of Food, &c—Report from the Committee.
110. Justices of the Peace—Return.
378. Standing Orders of the House of Commons.
404. Transportation—Lords' Report.
417. Legacy, &c. Duties—Return.
430. Russian Prizes—Return.
446. Insolvent Debtors' Court—Abstract of Return.
449. Divisions of the House—Return.
456. Criminal Procedure—Report by C. S. Greaves, Esq.
355. Transportation—Third Report from the Select Committee.
389. New Westminster Bridge—Report and Evidence.
375. Public Monies—Report from the Committee.
346. Rating of Mines—Report from the Committee.
421. Army, Commissariat, and Ordnance (1854-55)—Accounts.
332. Local Charges upon Shipping—Report from Committee.
362. Contracts for Public Departments—Report.
376. Friendly Societies—Report of the Registrar.
415. Commissions of Inquiry—Return.
422. (1.) Army (Supplies of the British Army in the Crimea)—Index to Report.
39. (8.) Trade and Navigation Accounts (31st August).
364. Medical Licenses—Returns.
425. Aldershot Camp—Return.
331. Medical Department (Army)—Report.
350. Municipal Boroughs (England and Wales)—Abstract of Return.
410. Bullion, &c.—Account.
418. Malt, &c.—Returns.
419. Navy, Army, &c. (Receipt and Expenditure)—Detailed Account.
445. Baptisms (Church of England)—Abstract of Return.
457. Collectors' Fines (Prescot Division)—Returns.
39. (9.) Trade and Navigation Accounts (30th September).
293. Tithes—Return.
355. (1.) Transportation—Index to Reports.
441. Workmen—Abstract of Return.
380. (1.) Sound Dues—Index to Report.
354. Pilotage—Abstract of Returns.
270. County Treasurers—Abstract of Accounts.
427. Paupers, &c. (Metropolis)—Returns.
444. Wills and Administrations—Abstract of Return.
39. (10.) Trade and Navigation Accounts (31st October).
435. Paupers (Metropolis)—Return.
375. (1.) Public Monies—Index to Reports.
447. Business of the House—Return.
337. (1.) Civil Service Superannuation—An Addition to the Appendix to the Report.
330. Woods, Forests, &c.—34th Report of the Commissioners.
382. Public Income and Expenditure—Account.
414. Superannuations—Return.
442. Burial Fees—Abstract of Returns.
369. (1.) Ecclesiastical Commission, &c.—Index to Reports.
332. (1.) Local Charges upon Shipping—Index to Report.
39. (XI.) Trade and Navigation Accounts (30th November).
438. Children in the Workhouses—Return.
443. Criminal Justice Act—Abstract of Return.
451. Public Petitions—Return.
319. Church Rates (Rates Refused, &c.)—Return.
267. Bill—Aberdeen Colleges.

Railway Accidents (1st January to 30th June, 1856—Returns.
Department of Science and Art—Third Report.
Mining Districts—Report of the Commissioners.
Convict Prisons (Pentonville Prison, &c.)—Reports.
Tariffs (Foreign Countries, &c.)—Return.
Highways (Receipts and Expenditure)—Statements.
Colonial and other Possessions—Statistical Tables, Part I.
Salt in British India—Papers.
Salt in British India—Conclusion of the Commissioners' Report.
Coal Mines—Reports of the Inspectors.
Prisons—Twenty-first Report of Inspectors (Southern and Western District), Part 3.
Trade of Foreign Countries—Abstract of Reports.
Census of Ireland for the Year 1851—Part 5. Tables of Deaths, Vol. 1.
Census of Ireland for the Year 1851—Part 6. General Report
Military Prisons—Report by Colonel Jebb.
Metropolis Water Supply—Reports.
Australia (Discovery of Gold)—Further Papers.
Australian Colonies—Further Papers.
Turnpike Trusts (Scotland)—Abstract of Income and Expenditure.
Trade and Navigation with Foreign Countries (1855)—Annual Statement.
Crown Lands in the Australian Colonies—Further Papers.
Foreign Countries—Statistical Tables, Part 3.
Paris Universal Exhibition—Reports, Parts 2 and 3.
Criminal Offenders (England and Wales)—Tables, 1855.
War with Russia—Addresses, Resolutions, &c., from the British Colonies.
Public General Acts—Cap. 62 to 120, and Table.

SESSION 1854.

448. (3.) Index to Reports of Commissioners (Cathedral and Collegiate Churches).

Delivered on 4th February, 1857.

323. Church Rates (Monies received and expended)—Return.

PATENT LAW AMENDMENT ACT.

APPLICATIONS FOR PATENTS AND PROTECTION ALLOWED.

[*From Gazette, January* 30*th*, 1857.]

Dated 26*th November*, 1856.

2802. Francis North Clerk, Birmingham—Improvements in metallic roofing for buildings, and in appendages to roofs.

Dated 9*th December*, 1856.

2916. Thomas Peake, Abbey-street Mill, Derby—Certain improvements in the manufacture of chenille and other piled fabrics.

Dated 12*th January*, 1857.

98. George Fergusson Wilson, Belmont, Vauxhall—Improvements in treating Burmese and such like petroleum, and their products.
100. Joseph Bennett Howell, Sheffield, and Nicholas Harvey, 12, Haymarket—Improvements in the manufacture of steam boilers.
102. George Eskholme and Henry Wilkes, Rotherham, Yorkshire—Improvements in apparatus for preventing waste of water from service pipes and cisterns.

Dated 13*th January*, 1857.

104. Alfred Bower, Liverpool—Improvements in or applicable to the keels of navigable vessels.
107. William Gossage, Widnes, Lancashire—Improvements in the manufacture of sulphuric acid, and in the construction of apparatus used for such manufacture.
108. David Cheetham, Rochdale—Improvements in apparatus applicable to steam and other boilers.
109. Michael Potter, Manchester—The application of certain materials in the manufacture of healds for weaving.
110. Robert Cameron Galton, Ham-common—An apparatus for giving alarm to the inmates of dwelling-houses in cases of burglary.
111. François Auguste Verdeil, 30, Rue St. Sulpice, Paris, and Emond Michel, 4, Quai Impérial Puteaux (departement of the Seine), France—Improvements in obtaining extracts from madder for dyeing and printing.
112. John Barsham, Albert-road, Kingston-upon-Thames—An improvement in the manufacture of mats or fabrics used for packing.
113. Robert Russell, Derby—Improvements in stoves and fire-places.

Dated 14th January, 1857.

114. Sir James Murray, M.D., Dublin—Abating the smells and increasing the fertilizing usefulness of liquid manures, sewage, gas, or other liquors, and for means of raising or propelling such mixtures and other solids or fluids to convenient heights or distances,

116. John Coope Haddan, 4, Cannon-row, Westminster—Improvements in smelting ores, and in roasting and extracting products therefrom. (A communication.)

117. William Edward Newton, 66, Chancery-lane—An improved steam engine. (A communication.)

118. William Edward Newton, 66, Chancery-lane—An improvement in rollers employed for calendering, mangling, and other processes of analogous character. (A communication.)

119. Gustav Adolph Blittkowski, New-street, U.S.—Improvements in breech-loading fire-arms.

Dated 15th January, 1857.

120. Alfred Charles Hobbs, 97, Cheapside—An improvement in locks and latches.

121. David Hamilton Fowler, New Orleans, U.S.—An improvement in steam boilers.

122. George Parker and William Martin, Manchester—Certain improvements in machinery for opening, cleaning, and preparing cotton.

123. Joseph Higham, Manchester—Improvements in valve musical instruments.

124. Charles Wye Williams, Liverpool—Improvements in furnace grates and fire-bars.

125. Thomas Frederick Henley, Bromley—Improvements in the preparation or manufacture of certain beverages or liquors of the nature and character of home-made wines, and in the means of obtaining the same.

126. Francis Watkins, Summerfield-cottage, Birmingham—Improvements in machinery for manufacturing bolts, spikes, and rivets.

127. Alfred Vincent Newton, 66, Chancery-lane—An improvement in steam engines. (A communication.)

128. Julius Homan, Milk-street, Cheapside—Improved machinery for folding cloth into lengths.

129. George Bedson, Manchester—Improvements in coating and insulating wire.

130. Matthew Andrew Muir and James McIlwham, Glasgow—Improvements in moulding or shaping metals.

131. Robert Adamson and Richard Holland, Preston, Lancashire—Certain improvements in looms for weaving.

Dated 16th January, 1857.

132. Samuel Haycraft, Birmingham—Improvements in anchors.

133. Thomas Jackson Milnes Townsend, Scarby, near Brigg, Lincolnshire—Improvements in drain pipes, and in machinery for producing the same.

134. John Edridge, Birmingham—Improvements in "safety pins" for dress and other similar purposes.

135. Henry Henson Henson, 38, Parliament-street—Improvements in treating animal and vegetable fibre and fabrics for preserving or waterproofing the same.

136. George Storey Moore, Monkwearmouth, Sunderland—An improvement in combining steam engines and boilers, when used with screw or stern propellers of ships or vessels.

137. George Tomlinson Bousfield, Sussex-place, Loughborough-road, Brixton—Improvements in sewing machines. (A communication.)

138. John Henry Johnson, 47, Lincoln's-inn-field—Improvements in [illegible]utching machines. (A communication.)

Dated 17th January, 1857.

140. Prix Auguste Théodore Pichon, Dijon, France—An improved process for accelerating tanning without the assistance of acids foreign to the bark.

141. Charles Frederic Vasserot, 45, Essex-street, Strand—A new beverage. (A communication.)

142. Charles Frederic Vasserot, 45, Essex-street, Strand—Covering all description of grain with a fertile substance or manure, and the apparatus employed for the same. (A communication.)

143. John Dennison and Henry Hirst, Halifax, Yorkshire—Improvements in looms for weaving.

144. Peter Walker, Warrington—Improvements in apparatus employed in distilling and in the manufacture of vinegar.

145. Augustin Leopold Autran, 39, Rue de l'Echiquier, Paris—Certain improvements in the wicks of candles and lamps.

146. Joseph Cooke and William Cooke, Shrewsbury—A new or improved rotary machine, to be used as a steam-engine, water-wheel, fire-engine, or pump.

147. Andrew Steinmetz, Middle Temple.—The improvement of circular gas burners and their chimnies (to be called the Steinmetz Burner and Steinmetz Chimney).

148. Robert Reeves and John Reeves, Bratton, Westbury, Wilts—Improvements in machinery for delivering manure for agricultural purposes.

149. William Warne, Tottenham—Improvements in the manufacture of deckle straps.

150. John Long, Tiverton, Devon—Improvements in the fastenings of brooches and other articles of jewellery.

Dated 19th January, 1857.

151. Nicholas Fortune, Paris—Improvements in the manufacture of knife handles.

152. Henry Vannoy, 25, Rue du Faubourg du Temple, Paris—Certain improvements in heating foot-stoves, beds, and applicable to various other similar purposes.

153. Thomas Sagar and Christopher Turner, Burnley, Lancashire—Certain improvements in power looms for weaving.

155. William Haslett Mitchel, Brooklyn, New York, U.S.—Improvements in means for distributing and composing types.

157. Edwin Clark, 29, Great George-street, Westminster—Improvements in floating docks.

158. John Bird, Chance's Fire Brick Works, near Dudley—Improvements in the manufacture of articles suitable to be used as window heads and sills, lintels, and other similar parts of buildings.

159. Edwin Clark, 24, Great George-street, Westminster—Improvements in machinery or apparatus for raising ships out of the water for the purposes of examination and repair.

Dated 20th January, 1857.

161. Thomas Edwards and Daniel Rowley, Brierley-hill, Staffordshire—New or improved machinery for rolling taper bars.

165. Richard Archibald Brooman, 166, Fleet-street—Improvements in the manufacture of petticoats and other knitted fabrics on circular looms or frames. (A communication.)

167. Thomas Johnson, Runcorn, Cheshire—An improvement in purifying alkaline lees.

169. William Henry Barlow, Derby, and Henry Woodhouse, 23 Parliament-street—Improvements in the permanent way of railways.

171. John Henry Johnson, 47, Lincoln's-inn-fields—Improvements in apparatus for the preservation of life and property at sea. (A communication.)

INVENTION WITH COMPLETE SPECIFICATION FILED.

180. Thomas Kitelee, Everett-street, Brunswick-square—Am improved combination of ingredients to be employed as a breakfast powder, or article of diet.—21st January, 1857.

WEEKLY LIST OF PATENTS SEALED.

January 30th.

1799. Robert William Sievier.
1801. Julien Denis.
1816. Thomas Routledge.
1827. Oliver Long.
1836. George Walker and James Scrimgeour.
1838. Alexander Wright.
1846. Jean Jacques Danduran.
1870. William Gorse.
1876. Thomas Whittaker.
1900. Alfred Priest and William Woolnough.
1970. Etienne Sterlingue.
2012. John Randolph Sees.
2882. Auguste Edouard Loradoux Bellford.
2884. David Crawford.

February 3rd.

1834. Nicolas Cadiat.
1844. Antoine Dominique Sisco.
1848. John Keith.
1864. Coleman Defries.
1882. Edward Owen.
1887. Richard Archibald Brooman.
1897. Jean Baptiste Clara.
1925. William Edward Newton.
1927. William Edward Newton.
1939. Joseph Brouard and Joseph Hubert.
1956. Robert Kenton.
2000. Alfred Vincent Newton.
2366. George Hallen Cottam and Richard Cottam.
2389. George William Varnell.
2815. James Higgin.
2897. James Perry.
2905. Richard Eaton.

Patents on which the Third Year's Stamp Duty has been Paid.

January 26th.

234. Luther Young and Edwin Marten.

January 27th.

201. Patrick Moir Crane.
238. Louis Christian Koeffler.
241. Pierre Joseph Meeus.

January 28th.

246. Claude Bernard Adrien Chenot.

January 29th.

227. John Kershaw.
240. William Wright and G. Brown.
261. Adolphe Mohler.
264. James Stevens.
273. William Longmaid and John Longmaid.

January 30th.

259. Joseph Beattie.
279. James Boydell.
328. Henry Warner, Joseph Haywood, and Wm. Cross.

WEEKLY LIST OF DESIGNS FOR ARTICLES OF UTILITY REGISTERED.

No. in the Register.	Date of Registration.	Title.	Proprietors' Name.	Address.
3940	Jan. 30.	Life Protector	Isaac Parkes..........................	Birmingham.
3941	,, ,,	An Omnibus Lamp......	Price's Patent Candle Company	Belmont, Vauxhall.
3942	Feb. 4.	Fastening for Coffin and other handles	Hector Richard Cooksey	Birmingham.

Journal of the Society of Arts.

FRIDAY, FEBRUARY 13, 1857.

NOTICE TO MEMBERS.

Members who have not received their cards of invitation to the Society's CONVERSAZIONE of Saturday, the 21st instant, are requested to inform the Secretary, who will forward the cards immediately.

EXAMINATION PRIZE FUND.

The following donations have been made since the last announcement:—

Alderman Challis, M.P.	£5	0
Charles Ratcliff, Esq., (annual)	10	10

EXAMINATIONS.

The Secretary having from time to time received letters asking for further information on several points in connection with the ensuing examinations, which seemed either doubtful or obscure, the Council are of opinion, that, when the questions involve points of general interest, the replies should be given publicly, for the benefit of all, in the columns of the Journal.

To the Secretary of the Society of Arts.

Sir,—We are busily occupied in preparing for the examination in June, but are in some difficulty to decide what books we shall use for reading the subjects of "Geology" and "History from 1603 to 1688."

The Examiners, in their printed instructions, recommend several works on each subject, but these we cannot procure without purchase, and this we could not afford. I fear, under these circumstances, it will not be in our power to procure more than one good work on this subject, and I should feel much obliged if you could assist us in making a selection.

I remain, &c.,

* * *

(reply.)

Society of Arts, Adelphi, London, Feb. 9, 1857.

Sir,—I am instructed by the Board of Examiners of the Society of Arts in reply to your inquiry, to state that the Examiners, in recommending certain text-books as eligible Manuals of Study, did not by any means wish it to be implied that all these books were to be read. They serve rather to show how much and what kind of knowledge will be required at the Society's examinations.

In the Examiners' report, under the head "Geography," the first book named in the list, Mrs. Somerville's Physical Geography, contains, probably, as much geology as the Examiners will require, and for English History, Hallam's Constitutional History will be amply sufficient.

I am, &c.,

P. LE NEVE FOSTER, Secretary.

To the Secretary of the Society of Arts.

* * * Mechanics' Institution, Jan. 30, 1857.

Sir,—Would you kindly inform me where members of the Institute, who are desirous of offering themselves for examination before the Society of Arts at Huddersfield in June next, are to undergo their preliminary examination, and could you, at the same time, supply me with printed forms which candidates are required to fill up and forward to the Society of Arts.

I am, &c. * * *

(reply.)

Society of Arts, Adelphi, London, Feb. 9, 1857.

Sir,—I am directed by the Council of the Society of Arts to state, for your information and for that of others, that while the Council attach the highest importance to the due organisation of the preliminary local examinations and their energetic working out, yet they have no authority to interfere either in their general arrangements, or in their several details. These are matters which exclusively belong to the local authorities or to combinations of the authorities of groups of Institutions in the same district.

While the Council of the Society of Arts stand aloof from any interference with the local management in the matter of the preliminary examinations, they will watch with lively interest the development of the principle, because they believe that on the amount of local sympathy thus elicited, and the cordial co-operation secured, will, in a great measure, depend the ultimate success of the Society's scheme of National Examination.

The Candidates' "forms of application to be examined" are now ready for delivery, and the number required (one for each candidate) will be transmitted by me on receiving a written application from the *Secretary* of any Mechanics' Institution, or *Principal* of a School, in union with the Society of Arts.

I am, &c.,

P. LE NEVE FOSTER, Secretary.

To ———

TENTH ORDINARY MEETING.

Wednesday, Feb. 11, 1857.

The Tenth Ordinary Meeting of the One Hundred and Third Session was held on Wednesday, the 11th inst., Thomas Webster, Esq., F.R.S., in the chair.

The following Candidates were balloted for, and duly elected members of the Society:—

Mackinnon, Commander Lauchlan B., R.N.
Plummer, Robert, jun.
Sanceau, Isidore Eugene
Stanton, William
Swan, Michael
Thomson, Robert
Vigers, Francis
Weguelin, Thomas Matthias.

The Paper read was:—

ON THE APPLICATION OF RAILS FOR HORSE TRANSIT IN THE STREETS AND ENVIRONS OF LONDON, AND ALSO FOR RAILWAY BRANCHES.

By W. Bridges Adams.

Facility of transit may be taken as a convertible term for civilisation. The earliest and cheapest transit being by water, the earliest settlements of mankind were consequently along the banks of rivers. When the banks happened to be high, as the site of old London within the walls, then the conditions of health as well as transit were attainable. When low, as in the marshes of Kent, Surrey, and Middlesex, then of necessity the conditions of health were difficult of attainment. Still, transit being the primary necessity of a city, the absence of facility other than by water caused an increasing population simply to radiate from a centre with little regard to the conditions of health. Now, inasmuch as man is by necessity a production of the soil and climate on which he is born and in which he dwells—modified by the quality of his food and clothing, and warmth and shelter—it follows that if London had followed the sites of the healthiest localities, *i.e.*, the high levels, and the low grounds had been preserved for gardens and orchards, the general population of London would have attained a higher condition of health, and, regarded from an economical point of view, would have been born and brought up at less cost, and would have resulted in a longer industrial life, as interest and sinking fund on the capital so expended. The low grounds left as garden and orchard would have been the natural recipient and deodoriser for the sewage of the high ground; improved health would have increased wealth generally, and prevented individual poverty, and, as a consequence, a highly moral population, the population of a healthy climate, would have existed throughout the metropolis, divested of the plague spots which the labours of philanthropists have laid bare and done much to remove—for London, natural London, is probably second to no part of the world as a healthy residence. Had our earlier legislative bodies understood the conditions of health, it is not improbable that a standard building act would have prohibited the erection of dwellings on unwholesome sites calculated to lower the standard of health and life, and thus have enforced the means of rendering them artificially healthy, or of forcing the population along the higher grounds. Had this been done, improved means of locomotion would have become an imperative necessity, and the brains of an earlier period might have induced the development of rails for town transit, as well as for the conveyance of minerals in distant localities. The absence of cheap transit, together with lower rents, induced the spread of buildings over unwholesome flats below the river level; but it may be taken as a rule, that the low rent is a fallacy, and that the doctor absorbs more than the difference, saying nothing of the loss of time and diminished length of life. As time rolls on, and knowledge spreads, it will be more and more understood that not merely the poor but the wealthy classes also, suffer in degrees by the existence of malarian humanity, and the probability is, that the appropriation of low-lying lands, as at Battersea, for public gardens, will in time lead to the removal of acres of brick hovels run up by building speculation, on sites, and with materials, utterly unfitted for the dwellings of human beings.

A more beautiful site for a great city could not well be imagined than this of London, having regard to so large a population. The hills or high levels of Middlesex, on the one side, and the hills of Surrey on the other, are the true sites for North and South London—the dwellings of health. The river flats are the garden-grounds laid out by nature, with the broad river rolling between for transit and drainage; space for air—space for exercise and recreation in fine weather—and for intersecting roads communicating with north and south. With the constant increase of population, the Surrey hills will assuredly be covered with dwellings, with the site of the Crystal Palace as a nucleus, and the expansion of London, with the increasing light of knowledge, will take the direction of the high grounds and go out of the low river levels, if the means of transit be facilitated. It is therefore the interest of the owners of estates eligible for building purposes, thoroughly to understand the best modes of transit.

Leaving the courses of the rivers, the earliest roads were tracks for horses and other animals. When the loads grew too heavy for the horses, sledges were substituted, and the sledges were subsequently converted into carts by the application of a roller beneath them, similar to the crushing roller of the modern farm. The roller, from its great friction on the surface of the ground, then assumed the form of a pair of wheels fixed on a shaft, which revolved in bearings, like the rowlocks of a boat. Such are the existing wine carts of Spain, Portugal, and other countries; and, curiously enough, such are in principle the wheels and axles of our modern railway carriages. The Portuguese cars have inside bearings, and railway wheels, have sometimes inside and sometimes outside bearings.

Fig. 1.

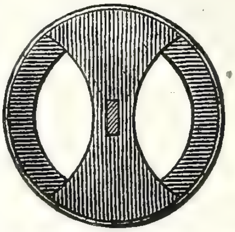
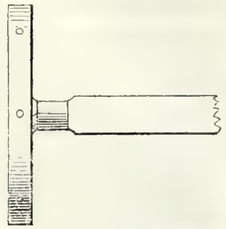
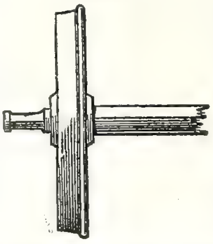


Fig. 2.



By reference to the diagrams, Figs. 1 and 2, it will be seen that the wheels of the Portuguese car, supposing them to be of equal diameters, are only calculated to run forward in a straight line. If they be of differing diameters, they represent a cone, and they will only run in a curved line; and any movement out of the direction they tend to, can only be produced with excessive friction, and a squeaking noise is the result, which is humourously ascribed to the orders of the custom-house officers, to guard against smuggling.

Fig. 3.



Referring to the railway wheel diagram, Fig. 3, it will be seen that the peripheries are conical in opposite directions, and that they rest upon the two rails with the guiding flanges between them. Therefore, on a straight line, the rolling movement will so adjust them as to keep the bearing on equal diameters. If the line of rails be a curve, the wheels will move to right or left till their bearing diameters correspond to the difference in length of the outer and inner curve of the rails, supposing that the play between the flanges and the rails be sufficient lateral to permit the movement.

But this is on the supposition of a single pair of wheels, with perfect freedom. If two or three pairs of wheels be attached to a single carriage, their free movement will be impeded. If the diameters of the wheels be all exactly alike, and the axles all parallel and rectangular to the traction, they may move on a straight line of rails without friction. If on a curved line, their movement will be one of considerable friction, unless the axles are made to radiate to the centre of the curve, and with free movement to regulate the coned diameters.

If the axles be arranged parallel to each other, but not at right angles to the line of traction, the free rolling movement will be converted into a sledging movement, and so also if the axles be not parallel with each other, save when on a curve corresponding to the angle formed by the axles.

All these evils are aggravated by screwing forcibly together a number of carriages to form a train, which becomes a kind of long sledge, moving with great friction, as may be verified by watching the polished glint on the surface of the rails after a train has passed over them, the burnish being produced by rubbing and not by rolling.

Trains of passenger carriages are thus screwed up together in order to prevent lateral movement, annoying to passengers. But trains of goods or coal waggons are left loose, connected by a chain. The first thing an engine-driver does when about to take out a train of coal waggons is to back them all one on the other. The first one starts the second, the second the third, and so on, the impetus gradually increasing and overpowering the inertia till the whole are close together. The engine then advancing in the opposite direction starts the first, second, third, and so on, till the whole train is in motion.

If watched from a bridge above, the train will be seen in sinuous movement, the wheels of each waggon moving laterally to accommodate themselves, not to the great curves, but to innumerable small curves, formed by the irregularities of the rails at joints and elsewhere, the wheels pressing at intervals on the inside or the outside of the rail breadth.

So long as two-wheeled carts were used upon rough roads, it was just possible to overcome their friction, but when the loads became heavy enough to require a waggon on four wheels, movement became impracticable, even though the front axle was made to turn at an angle with the hind one. This necessitated the revolution of each wheel on an axle-arm independently of the other wheels. The sledging movement was thus immediately convertible into a rolling movement, with greater or less friction according to the structure of the axle and wheel and the good or bad surface of the road.

In proportion to the roughness of the surface it became desirable to increase the diameters of the wheels to span the hollows. But very large wheels have advantages and disadvantages also. If the speed be very great, the axle friction is reduced by diminishing the number of revolutions—a positive advantage. But a very large wheel becomes a disproportionately heavy wheel, and for steep ascents, for horse traction, frequently loses more than it gains, while for descents it helps to overrun the horses. It became, therefore, a much more desirable thing to improve the roads than to enlarge the wheels.

The earliest roads were the simple surface of the earth. When worn into ruts, a new and parallel track was taken, and then another and another. What are called wheel roads in the Pampas of La Plata and the steppes of Russia, are examples of this. But this kind of accommodation was only available on broad plains, with land of little or no value. On valuable land, or in mineral districts or rocky valleys, it was needful to repair the tracks when worn. Where stone existed, the obvious method was to break it into small pieces, and throw it into the ruts, as was the case in Derbyshire and elsewhere, and this no doubt was the earliest kind of macadam.

In the coal districts of the North, where land was valuable, it became the practice in opening a coal-pit to hire a "way leave," or right of way, or leave a way open which, if the pit worked out, could again be used for cultivation or grazing. If the ordinary ground was used to travel on, a horse could only draw about 17 cwt. of coals, and to amend this the earliest railways were devised, viz., a system of cross sleepers, placed two or three feet apart, and on these were trenailed down longitudinal wooden rails, squared to a section of six inches broad by five inches deep, the guage of way being four feet. On these wooden rails, which formed a substructure, were trenailed down other pieces of timber, which could be taken away and replaced when worn. On this kind of railway a horse could draw 42 cwt., or two-and-a-half times the load of the ordinary road. The introduction of these roads took place about the year 1600. It was, of course, necessary to level the ground beneath and around the timbers for the horses' feet, and this therefore constituted the first invention of railways, an invention forced on by the absolute necessity of a continuous stream of traffic which ordinary roads were unequal to.

The wear of the timber begot the practice of covering it in parts with plates of iron, in strakes like the tyre of a wheel. Subsequently cast-iron plates were used, of an angular form, stretching from sleeper to sleeper, an elevated rib rising from a flat plate fastened down to the sleepers, the ribs being either inside the wheels or outside. This kind of rail was called the tramway, either from the name of the engineer who first used it, Mr. Outram, or from the fact of its tramelling the wheels to their path. The objection to it was the facility of dirt lying on it, impeding the path of the wheels. This is shown by Fig. 4.

This ultimately gave rise to the invention of the edge-rail, *i.e.*, the rail projecting above the surface of the ground, and without a guiding flange, which was applied to the wheel instead. The forms of the rail were various. Fig. 5 shows a section of rail, with a broad flat base, spiked down upon sleepers, commonly used in the United States. Fig. 6 a bridge rail, usually screwed down upon sleepers. Fig. 7 a rail with a broad head but narrow base, to provide for which a cast-iron chair is used. Fig. 8 shows the double-headed rail, also used with a chair, and intended for reversal upside down when worn.

Fig. 4.

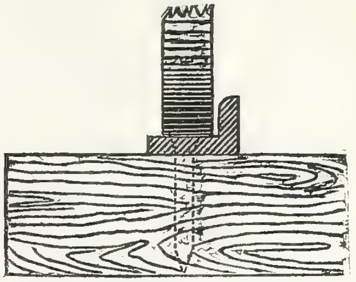


Fig 5.

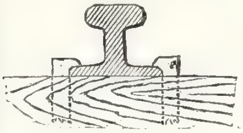


Fig. 6.

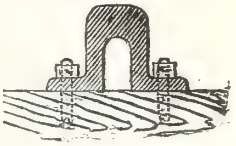


Fig. 8.

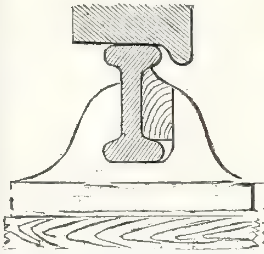
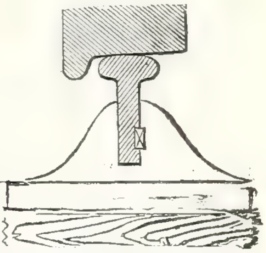


Fig. 7.



All these systems of rails, whether tramways or edge rails, project above the surface, and the wheels are guided by both rails, and cannot be guided by one rail only, or they would run off. This fact involves a very complicated arrangement of what are called switches and points and crossings, when it is required to move a train from one line of rails to another, a system which involves also great expense in repairs and considerable risk of getting off the line, in case of any irregularity at high speeds.

The fact of projection above the surface, and the speeds used, led to a general impression that railroads must be distinct roads from highways, and that it would be impossible to use the same road for both purposes. Yet even upon the railways the fact was practically demonstrated to be otherwise, for at what are called level crossings the spaces between and outside the rails are boarded over to the level, to allow ordinary vehicles to pass over them. It is true that this involves a greatly increased expense.

In years past before edge railways existed, I was familiar with many of the locomotists who advocated and practised the use of steam carriages on common roads, and who, considering the difficulties they had to contend with, practically accomplished great results. Mr. Walter Hancock was one of the most untiring, and I frequently pointed out to him that his chief difficulty was the want of solidity to sustain the load of his wheels, and that he must take either to stone curbs or iron rails before he could succeed. He could not accomplish this; for although the law allowed him to run his steam carriage on the road, it did not allow him to repair, and still less to improve the road. The law allowed the road trustees to dictate the width of tyres in proportion to load, or to charge accordingly, yet, notwithstanding, permitting dished wheels, with coned peripheries, to scoop out the road while rolling, without regard to damage, but giving no specific instructions as to the hardening of the road itself, so that the injudicious application of road metal could, at their will, prevent traffic altogether.

Still, my own conviction remained that iron tracks were the true solution of the problem. In proportion to the smoothness and hardness of the surface is the facility of draught and the saving in wear and tear of vehicles. A railway is better than a highway, in virtue of its hard and smooth surface, its self-guidance for the vehicles, and its better level. But if the vehicles running on a railway be greatly in excess of its strength, they may involve more resistance than an omnibus running on a hard modern road which does not yield under the wheels.

A rail should be—having regard to the load on it—so wide as to prevent lateral deflection, and so deep as to prevent vertical deflection in itself, and it should have so much surface bearing as to prevent it from sinking in the ballast.

But it is not necessary in all cases that the haulage on rails should be performed by steam, though in most cases that is the cheapest mode of traction. The steam railways in the United States have given rise to horse railways through cities and towns. They began in a peculiar manner.

The American railways, it is well known, were made to run to and through towns and cities, instead of to them only. The inhabitants were rarely anxious, as in England, to keep the rail away from them, but the contrary. It was deemed necessary to run round street corners. The first engine was ordered in England, and was built by Messrs. Robert Stephenson and Co., at Newcastle-on-Tyne, with the requirement of going round a sharp curve. It was, therefore, constructed as a two-wheel engine, with a swivelling truck on four low wheels in front. This kind of truck, used in the workshop to carry large castings, was known under the euphonious name of a "bogy." The engine was, therefore, shipped and invoiced as a bogy-engine. From that sprung up the whole race of American bogy-engines and carriages upon two bogies, or eight wheels, and Brother Jonathan claimed it as his invention; but that is all—in his own quaint phraseology—"bogus."

When the first railways began to work, the town-authorities stipulated that the engines should be unhooked, and horses used to draw the trains through the streets; though subsequently this was compounded for by working the engine slowly, under a large maple slab, on which was painted:—"Look out for the engine when the bell rings."

Once familiarised with railway carriages drawn by horses, the observant American mind was not slow to perceive that the arrangement was very superior to omnibuses for town transit. Street after street in New York and other cities was laid down with rails, and on streets of great traffic many lines of rails were laid down side by side. Broadway is one of the few streets without them, and even that has been the subject of a law-suit between *pro* and *con* railers.

A Frenchman imported the plan to Paris, and it is probable that it will become an universal Continental practice.

But it has not been done in England, not done in London, in Manchester, or other great towns, where the amount of traffic seems imperatively to call for the introduction of the system. Why has it not been done?

The answer is plain. The whole thing is so simple and easy, and the outlay needed so small, that there is no scope for either lawyers or engineers. There are neither bridges nor works to execute, nor, if managed rightly, any Act of Parliament to obtain, and no large number of persons to be interested.

In any change to be made, people of considerable energy are required, with good capacity for business. These people are not numerous, and justly require high payment. It is a very common thing to quarrel with engineers, and lawyers, and contractors, and vituperate them for making large fortunes out of railway shareholders, but we may be quite sure that, but for the large prizes held out as inducements to these men, we should have had no railways. Individual energies are the sources of national gain.

My own pursuits having been connected with transit of all kinds, both before the advent of railways and after, and having, moreover, been many years a traveller and sojourner in various other lands, observation would have been forced upon me, even had not taste and perception led me to speculate upon, and essay to improve, the facilities of transit, whether by land or water.

Revisiting England in 1826, where the steam-locomotists on highways were earnestly at work, the subject attracted much of my attention, and I very soon came to the conclusion that steam could not work to advantage upon gravel or macadam, and that the first thing to do was to lay down stone slabs or iron rails. But there was a prevalent crotchet about adhesion, and an unfortunate insufficiency of purse amongst the projectors, and an utter unpopularity amongst all those connected with horseflesh. The legislature liberated the locomotists from tolls, but road trustees and surveyors were free to bury the wheels to their axles in loose road metal, and ostlers at public-houses demurred to supplying pails of water to other than their own horses. The late Mr. Walter Hancock, in spite of all obstacles, was finally successful in running a steam-carriage as an omnibus from Paddington to the Bank and back during a period of four months, and then the struggle ceased. To have made it successful, there was needed, not one, but twenty steam-carriages at least, with station houses, water cranes, coke depots, and—rails. And all this needed a company and capital, which were never got together, as the scheme did not acquire popularity.

I once asked an omnibus proprietor, whether he would like the monopoly of the road between Charing-cross and the Bank, starting every half-hour. "Lord bless you, sir," was the reply, "I should never get a customer; they would all walk on."

And this is one reason of the difficulty in introducing improvements; the single public carriage is lost, however much superior it may be, and it is too much to expect of human nature that the proprietors of existing vehicles should deteriorate their own capital by helping forward improvements. Any improvement in public transit must be the work of a company or of large capitalists, in order to make any way against opposition.

Rails on common roads being a favourite subject, I constantly advocated them in print and words. About the year 1843 I wrote an article in the "*Westminster Review*," in which I advocated laying down rails in streets, flush with the surface. In 1845, I advocated the same general system. In 1849, I published a pamphlet, entitled, "The Iron Ways," which was reviewed in the "*Times*" and "*Spectator*" and the railway periodicals. In January, 1850, I published a little work, entitled "Road Progress, the Amalgamation of Railways and Highways for Agricultural Improvement and Steam Farming;" treating of highways, railways, steam-carriages, turnpike roads, railway wheels and farm railways; and in Dec., 1850, I read a paper, advocating the system, before the Society of Arts, in which I stated:—

"It would be easy to convert the turnpike roads into a system of practicable railways, by inserting rails level with the surface, to travel on at stage-coach speed by steam. This arrangement would place the whole of the agricultural districts of England in a rapidly improving condition, the farms at one end of the line and the markets at the other. The ordinary traffic would not be interfered with by this plan of rails, as vehicles could cross and recross them."

In 1851, an attempt was made by Mr. Thomas Wright, to get up a company to make street railways, but without success.

Even supposing the street railway, *i.e.*, the permanent way, to cost as much as the steam permanent way, *i.e.*, about £2000, per mile single way, still it would be a source of great economy to make it. A notion prevails that as on common roads the vehicles are comparatively light, very light rails will suffice, but this is not the fact. The rails on common roads would be subjected to side blows and diagonal blows from heavy coal waggons and other vehicles, and therefore they need be heavy and tough. Wrought-iron only can be used, for cast iron always crumbles away at the joints, even when made strong enough not to break by blows. If wrought-iron be used, it may be used with or without timber sleepers. In most cases, it will be an advantage to use no timber whatever, on account of its rapid destruction, but if used it should be merely as a packing below the rails, and not as a part of the structure.

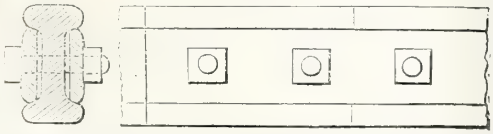
The structural detail is a matter of great importance. The requisite conditions are :—First. Strength to resist violence. Secondly. Simplicity of structure and fewness of parts. Thirdly. Sufficiency of depth and width to give vertical and lateral resistance, and continuous strength at the joints. Fourthly. Facility in laying down, maintaining, and replacing. Fifthly. Non-interference with access to drains and sewers, and water-pipes below. Lastly. Economy in cost.

I have had many plans of structure with rails made on purpose, but it has for some time past occurred to me that the existing rails of railways worn out by the locomotive are perfectly well adapted to street use. They therefore afford us the means of great strength of iron at low cost.

There are two considerations, either to adapt the street rails to the wheels of the ordinary omnibuses and cabs, or to adapt them to a special form of wheel tyre.

For ordinary wheels, my plan is as follows :—The common double T rail used on the narrow guage railways is as Fig. 9, 5 inches in height, and $2\frac{1}{2}$ inches in width. It is connected together at the joints by a patented invention of mine, called the fished joint, iron fishes fitting in the lateral channels, bolted by four cross bolts.

Fig. 9.



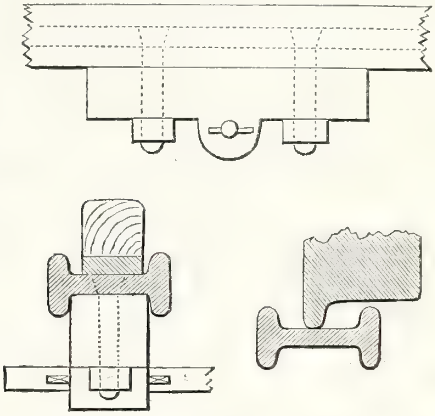
In practice the wheels of the locomotives with six tons dead weight on them, abrade the upper surface, while the lower surface is damaged in the chairs. But the side channels remain intact. I therefore take the rails and lay them down flat, bolting them at the joints to a block of cast iron through the fish bolt holes, the same block being provided with a horizontal hole, in which is received a tie or guage bar, connecting the two opposite rails together, as shown in Fig. 10.

These rails, 15 feet long, are laid in the ground flat with the surface, and the tie-bar, buried below, keys them down. As the greatest load that can come upon them is one ton per wheel, instead of six tons per wheel in the vertical position, the strength will be more than ample.

There is another consideration, their bearing surface on the ground to prevent the rails from crushing in. As usually laid on railways, the bearing surface is formed by the sleepers. In a first-class cross sleeper road the sleepers are laid three feet apart; the practical bearing surface of each sleeper is about six feet, which is about two feet per foot run of the two rails. The two rails laid flatwise give a bearing surface of 10 inches per foot run. If, therefore, two feet be equivalent to 12 tons on two wheels, 10 inches will be more than ample for two tons on two wheels. In the case of the locomotive, the bearing is two inches per ton; in the case of the street traffic it is five inches per ton; and the lateral strength of each rail is increased from $2\frac{1}{2}$ inches to five inches. They would be competent to engines with not more than two tons on each wheel.

In the channels of these rails the ordinary omnibus wheels can run, and, supposing the guage the same, ordinary railway waggons could run equally well, the wheels running on their flanges instead of their tracks.

Fig. 10.



In the tramway, Fig 4, and the edge railway, Fig 5, it will be seen that both rails are essential to keep the waggon in track. But it is worthy of remark that in these channel rails one rail only will serve for guidance, and the opposite rail may be a simple plane surface, as in Fig 14. Considerable lateral friction may be avoided by this arrangement, as it will permit of slight inaccuracies of guage in the omnibus wheels.

There is one disadvantage in the channel rail,—dirt may get into it, which will not rest on the edge rail. This may be obviated in two ways; a spring scraper may be attached to the vehicle, and smart lads from the red or blue Shoe Brigade might be selected and provided with a crooked stick each, to patrol the line.

It is obvious that ordinary omnibuses running on these rails would be in no difficulty; if requiring to turn off and run on ordinary roads, they can easily be turned out of the rail channels, without any necessity for points and crossings, or any of the expensive paraphernalia needed on railways by reason of the great weights.

The junctions for ramifications are easily made by connecting two lines side by side with a double casting and cutting away the rib between them.

On ordinary roads it will be found sufficient to use a macadam surface between and at the sides of the rails. In streets it would be desirable to pave next the rails, if not all over the surface, and my plan of paving would be different from the ordinary road.

For the passage of wheels, it is desirable to have the surface as smooth as possible, but for foot hold for horses' feet it is desirable to have a certain amount of roughness. The earliest stone-paving was with boulders, gradually replaced by cut granite, in pieces of greater horizontal width than vertical depth. The present practice is to use these deep stones laid in parallel lines, and to connect them by hot lime grouting. When new the surface is rough and suited to the horses' feet, and the interlocking of the groutings makes the stones a continuous body. But the surface wears smooth, the grouting cracks, and the stones sink in detail, being vertical and each depending only on its own base when the bond breaks.

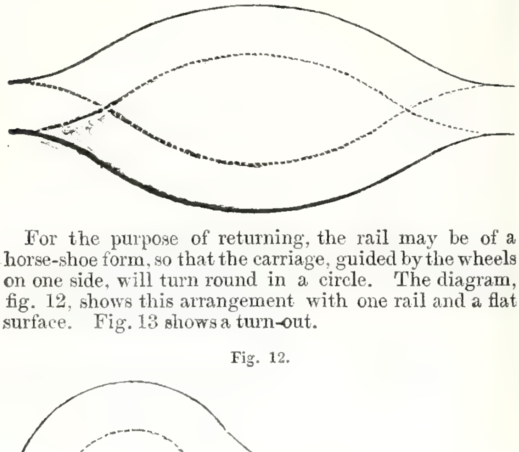
I propose to lay the stones at an angle of about 45° one upon another. Thus in the case of vertical blows every stone is supported by the others, and there is less tendency to crack the grouting. Moreover, one of the upper edges of the stone is an acute angle, which instantly breaks away as it is worn thin, and a surface adapted to the horses' feet is thus maintained to the last.

In the railway wheels which are fast on the axles as shown at Figs. 3, 7, and 8, the cone form of the peripheries, as before described, is supposed to compensate for curves and irregularities. If it does this, it is clear it ought to run as it were on knife-edges. If the profile of the wheel corresponds to the profile of the rail it is clear that a large amount of friction must ensue analogous to that produced by broad waggon wheels which are dished and curved on their peripheries. The vertical wheel is in all cases best, and with a cylindrical tread, but it is essential also in such case that every wheel should run loose on its axle.

It is essential, also, that brakes should be used for the purpose of stoppage or for retardation on inclines, and very simple mechanical means may be rendered available to facilitate the transit up inclines.

Supposing single lines to be used in the first instance, it will be desirable at intervals to make turns out, as shown by Fig. 11.

Fig. 11.



For the purpose of returning, the rail may be of a horse-shoe form, so that the carriage, guided by the wheels on one side, will turn round in a circle. The diagram, fig. 12, shows this arrangement with one rail and a flat surface. Fig. 13 shows a turn-out.

Fig. 12.

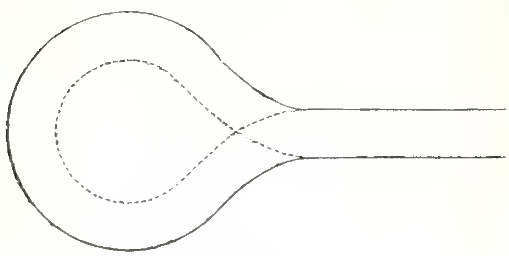
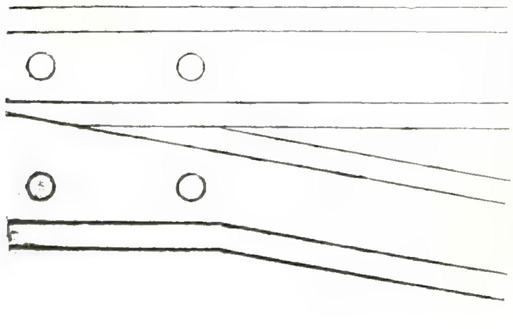


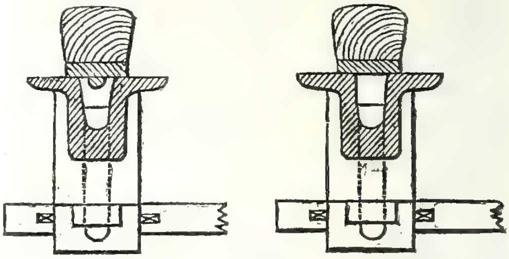
Fig. 13.



This system offers peculiar advantages to railway companies for communicating with towns and villages at a cheap rate. They have abundance of iron rails, and the cost beyond the rails scarcely exceeds two to three hundred pounds per mile. There are many localities where railway communication is very desirable, but the cost of works, bridges, permanent way, stations, and Act of Parliament, is an absolute prohibition. In most cases there is a highway or turnpike, or occupation road, skirting the rail and communicating with the town. With the old rails laid on the road on the plan just shown no stations are required, for the rails can carry vehicles to the doors of the existing inns along the existing streets, and if horses be not sufficient, small engines, with wheels of small diameter, and not more than two tons on each wheel, can be used on them, a class of engine adapted to the makers of the portable farm-engines.

So far as regards the conversion of the ordinary double **T** rail to streets and roads; but there is another rail also well adapted to the same purpose, and possessing greater lateral and vertical strength for this purpose, — the bridge rail, Fig 6. The form of the bridge rail is a hollow, and it is applied as shown at fig. 6, upon railways. For street and road purposes it is reversed, with the groove above, resting on the bottom and the side flanges, as shown at fig. 14. At the joints, the connection is made by a channel-formed iron casting, bearing beneath the flanges and bolted through the crown of the rail. A tie-bar passing horizontally through the casting connects the two opposite rails together.

Fig. 14.



The wheels to run on this kind of rail will require flanges in the centre of the breadth of the tyre, as shown. But it is not necessary to have flanges except on one side of the carriage; the opposite side may be plain tyres. A spring scraper will keep the grooves clean, or a boy can be employed. All the other arrangements will be the same as before described with the double **T** rail.

These rails are six inches wide each, and about 3½ deep, therefore the bearing surface of 12 inches should be equivalent to six tons, or three tons per wheel.

This system of rails through the streets affords a facility for carrying on the traffic, when access is required to the water-pipes, drains, or sewers, which is not the case with the ordinary paving, as most people know to their very great vexation. With the rails, if there be need to excavate below them, the operation would be to open up horizontal trenches transversely at three to four feet apart in which to lay sleepers for the rails to rest on, much in the same mode that is used to suspend the water-pipes. On the sleepers are laid planks for the horses, and thus the excavation can go on below without any interruption.

Ordinary wheels could not run on these bridge rails, but light engines could, in suburban districts, or on railway branches.

It is obvious that convenient carriages, similar in construction to railway carriages, could be used on these lines, but without the necessity for their great dead weight. Frames and wheels might all be of the lightest construction, as there is no longitudinal concussion to apprehend.

This paper relates to the streets and suburbs of London in particular, but the result would be extension to communicate between railways and turnpike roads. I will, therefore, read an extract from "Road Progress," bearing on the subject.

"The original cities and settlements of mankind are found along the banks of rivers, as being the best adapted to their wants during the rude state of the arts. There is usually found the best meadow land; there is found water for transit purposes, and for the purpose of turning mills, for grinding and fulling, and for tan-pits and dye-houses. The valley of the river also forms the level for the highway. But to set against all these conveniences, the sites are usually unhealthy, and as population increases, the stream becomes a filthy open sewer.

"With the railroad—the artificial level—all this may be changed. With the water main, the gas main, and the sewer laid along that level, houses and farms become practicable. Irrigation and manure are available through the whole extent. With the farms on the railway line, and the markets at the terminal and other stations, the reduction of expense in transit would be carried to its maximum. So long as a few miles of horse transit to a railway, and a few miles from the railway, shall be needful, the railway will be comparatively of little use; the expense of double trains, and loading and unloading, will destroy the profit.

"It is this consideration that renders it imperative to devise some means whereby farms in general may be connected with railways, and this opens up the general question of turnpike roads, highways, and parish roads.

"According to the Parliamentary Report for the year 1847, there exist 22,324 miles of turnpike roads in England and Wales, about 20,000 being in England alone.

"The total income from these English roads was £1,242,393 6s. 8d., or about £62 per mile.

"The total expenditure on these English roads was £1,256,056 4s. 7d., exceeding the income by £13,662 17s. 11d.

"The mortgage debts £6,262,998 17s. 2d., or about £311 per mile.

"The unpaid interest £1,467,238 17s. 11d.

"The total debts £7,873,252 6s. 5d., or about £394 per mile.

"MAINTENANCE OF WAY.

"Manual labour	£299,499
"Teams and carriages	126,751
"Materials, land, and drainage	192,255
"Tradesmen's bills	46,085
"Total	£664,590

or about £33 per mile.

"What the highways and parish roads amount to in mileage, no parliamentary data are yet given, but they must far exceed the turnpikes in amount.

* * * *

"The first objection that will be made to this proposition is, the rendering the roads impracticable for other purposes.

"In answer to this, the proposition is to insert the rails in longitudinal timbers, the whole being bedded to the level of the road, so that they will not prevent the occasional transit over them of carts and wagons, any more than the existing level crossings of railways or tramways. Supposing the roads to be of sufficient width, the best position of the rails would be the centre; and if we suppose the present railways to be bordered with highways on each side—turning out when required, we should have a similar result. Even at the towns, and through them, if the streets were wide enough, it would be better not to go round, as is the case in the American towns at present; so that we have examples for those who will not believe till they see, and will not put in practice anything till they do believe—the class of people who would be Chinese, were there no "outside barbarians" to stir them with new matter.

"But in old towns, where the streets are narrow, crooked, and hilly, the road must go round by the back by a turn-out. The inevitable result of this must be, that the back street would become the main street. Thus, in most roads the rail would be in the middle, but in many it would occupy one side. The minor difficulties of fixing water-tanks so as to supply engines in the middle of the road, would be very trifling. The existing sign-posts indicate the means sufficiently.

"Difficulties may occur occasionally in crossings being objectionable on the level, but in such cases it is not difficult to span the way with bridges. It must be borne in mind that the subject is always treated with reference to light carriages and engines; and when it is considered that for many years an incline of one in thirty-seven, three miles in length, has been worked by the ordinary heavy trains, there can be no difficulty in imagining that the ordinary highway gradient—the Telford gradient of one in thirty—can easily be worked by the ligh trains, so as to keep the approaches to bridges short.

* * * *

"Another objection will be that rails laid on highways will be subject to various damages from accidents. Heavy waggons may damage the rails, by wilful violence, and the way may be obstructed purposely, or by stones rolling into the grooves left for the flanges.

"In answer to this, we may assume at the outset, that such rails will not be laid down without two preliminaries, the desire of the road creditors and managers, and also those whose property it passes through, and an Act of Parliament to sanction it. There cannot be much doubt that the road creditors will be willing; for they want tolls—interest for their money. And the same class of persons who now break stones on the roads would have to keep them clean—viz., the paupers. Of accidents there would be little risk from getting off the rails, because the railway would be light, and the rail joints would be continuous, with a hard road on the same level. With regard to heavy waggons being used wantonly to damage the rails, remedies would be provided for that; but the fact would be, that no heavy waggons would be used, when once a railway existed—they would not pay.

* * * *

"It is quite certain that from the time the first road shall be shown to be practicable, the whole of the main roads in the neighbourhood of London will be laid down with rails. The saving in "maintenance of way," would be economy—for the average £33 per mile of the turnpike roads must be very largely increased in the environs of the metropolis by the large traffic.

* * *

"Of the value of an alliance between highways or turnpike-roads and railways some idea may be formed by calculating the difference between two thousand pounds per mile laid out on the highway to connect Nine Elms with London Bridge station, and the sum actually expended to get from Nine Elms to the Waterloo-road, half way to London Bridge, only substituting one inconvenient terminus for another.

"It is the interest of so many persons, householders, landholders, farmers, and others, to bring about this change, that it cannot be put off longer than till the practical demonstration shall have taken place in a sample line of road. Most new things, till done, are regarded as Utopian and impracticable.

"Had the perception of the practical importance of this proposition dawned on the minds of local authorities, the expense of the costly branch lines that have diminished dividends, might have been avoided, and lines of way skirting the dwellings of the population might have been attained at a very low cost. Whenever a highway-bridge, or turnpike-road, or occupation-bridge, crosses a line of railway, there is the point for a junction, which for light trains might generally be accomplished with very little expense in forming the gradient.

"Now supposing such junctions formed, and that rails be laid down on the roads leading to the town, direct railway waggon communication is obtained. From these towns the parish roads diverge, and rails laid on them might be carried direct into the farmyard. Here, then, we have the produce at one end of the line, and the metropolis or other town at the other end. Under such circumstances, the farmer's carts and waggons would be put out of use, and the light locomotive would be standing in his yard, having brought him a freight of coals, or stone, or earth, or manure, in exchange for his wheat or vegetables.

"From this farmyard, lines of moveable rails would be found well adapted to take the waggon and manure by horse-trucks to the centre of each field; or a farm locomotive might be established thereon—a preparation not for ploughing, but for doing the same kind of work better by harrowing; or it might be used to pump water up, to drain away, or to pour over the fields in irrigation; or to inject gaseous manure, or heat, or both combined, beneath the surface of the land for the sake of improved produce. With a small portable saw-bench and morticing machine ready to connect to the engine, the farmer might, with the rude skill of his own farm-labourers, construct, from time to time, all the wood-work he might require, as is the common practice among farmers in the United States.

"It is difficult to estimate the importance of carrying *coals* by rail direct on to farms. From that time the farm will take rank with the factory in its labour-saving processes, and the production of food will be so cheapened as to put to rest for ever the fear of foreign competition. Without cheap coal, farm operations can but be very imperfect."

The very large district lying on the borders of the Great Northern Railway, on the Lincolnshire flats studded with towns and villages, is admirably adapted for this system, and so also are the levels bordering the Eastern Counties system of lines, in Cambridgeshire and Essex.

Having now gone through the mechanical question, and I trust demonstrated the certainty and facility of the operation, I come to the question of London and its suburbs, the direction of the lines, their length and cost.

There are several centres from which streets and roads radiate. The most prominent is Charing-cross. We will take the various points it is desirable to reach from thence, and the distances.

Charing-cross Centre.	Distance in Miles.
Spring-garden, St. James's-mall, Buckingham-gate, Victoria-road, Commercial-road, and Battersea-park	2
Buckingham-gate to South Kensington	1¾
Charing-cross, by Piccadilly, to South Kensington	2¼
Battersea-park to Sloane-street, Knightsbridge	1½
Round Battersea-park	2
Sloane-street, Kensington, to Chiswick	4
Battersea-park to South Kensington	2
Hyde-park-corner to Sloane-street	½
Charing-cross to Regent-street, Oxford-street	1¼
Charing-cross to Gracechurch-street	2¼
Charing-cross, Parliament-street, Victoria-street, and Vauxhall-road	1¼
Tottenham-court-road and Oxford-street Centre.	
Tottenham-court-road to Tyburn	1¼
Tottenham-court-road to Kentish-town-hill	2½
Camden-town to Kentish-town-hill	3¾
Tyburn Turnpike to Hampstead Railway	3
Tottenham-court-road to Gracechurch-street	2
St. George's-road, Obelisk Centre.	
London-bridge, Blackfriars, and Waterloo	3
Elephant and Castle, two routes	½
Dover-road, Old-street-road to New-cross	2½
Elephant and Castle Centre.	
To Dulwich and Crystal Palace	6¾
To Brixton	3½
To Clapham-common and Balham-hill	4
Gracechurch-street Centre.	
To Stamford-hill	4
To Bow, Stratford and Eastern Counties Railway	4½
Shoreditch Church, Victoria-road and Clapton	4
Paddington to the Bank, by the City-road	5
City-road and Holloway-road	3
Total	69

Railway companies, with their own workmen and their own old rails, would make their lines at from £750 to £800 per single mile.

Supposing the lines made by individuals, or small companies buying old rails, the cost might be about £1,000 per single mile. The total double mileage would therefore be, say 140, and the capital £140,000. Taking depreciation and maintenance at 20 per cent. per annum, the annual outlay would be £20,000 a year, being the large sum of upwards of £200 per mile, and far beyond what it would really amount to in practice.

The existing omnibuses are about 1,000 in number. We may assume that they pay, or they could not be maintained. The result of the rails would be to diminish the traction by at least one-half. To keep these omnibuses going at present requires 8,000 horses. We may assume the interest and maintenance to amount to at least 15s. per week each. If one-half were saved, that would amount to £3,000 per week, or £150,000 per annum. This leaves a large margin for—shall we call it propitiation—dealing with parishes, and diminishing their paving rates in order to avoid Acts of Parliament.

But a new class of omnibuses would arise, of more convenient structure, and the result would be to increase the number of passengers, while diminishing the cost of transit. It would not be a large undertaking for a company to lay down the whole of the rails for the main thoroughfares and suburbs of London, but it might also be done by separate companies.

We will take another contingency. It might happen that old rails would rise in price by the demand for them, instead of being sold for old iron. The lines might cost, say £1,200 per mile.

From the Strand, over Waterloo-bridge, by the "Elephant and Castle," to the Crystal Palace, measures about eight miles. This would be £9,600. Say £2,000 per annum depreciation and maintenance. The time of transit would be about one hour. The vehicles could be as comfortable as railway carriages, and much lighter, lighter in fact than ordinary omnibuses, in proportion. They could carry 56 passengers each, and they might follow each other every five minutes, or less. Twelve vehicles would thus convey 672 passengers in less than two hours. Twenty-four vehicles, at shorter intervals, 1,344 passengers in two hours, and would land them at the level, saving the "getting up stairs." Of course, extra haulage would be required on the steep inclines, but extra horses or small engines might be used for that. The vehicles could be all on return in two hours, and be taking several batches. In short, with 24 vehicles, 56 passengers at one hour from the time of starting, could be delivered every 2½ minutes, or 1,344 per hour. Six hours running would be equivalent to upwards of 8,000 passengers delivered, and six hours more for the return, making 16,000. At sixpence per head, this would be £400 a day. Take the vehicles only half full, it would leave £200 per day, or £62,600 a-year revenue, without counting Sundays. If one-fourth full, £31,300. The account would stand thus:—

Capital.	
Railway	£9,600
Say 30 vehicles	9,000
	£18,600

Working Expenses per Annum.		Revenue if One-Fourth full Vehicles
Maintenance of way	£2,000	£31,300
Do. of 24 vehicles, 28 miles a day each	2,000	
Horse-hire, 200	10,400	
24 drivers, 24 conductors	5,000	
Tolls, say	3,000	
		22,400
		£8,900

The extreme capacity for transit would be, taking going and returning, at 6d. per head each, £125,000. Now when we consider we have the Crystal Palace, the dwellings along the line, and the dwellings yet to be erected on eligible building land on the Surrey hills, and possibly many fairy gardens yet to be made for public resort, we may certainly calculate one-fourth full, and if the fare were reduced to 4d., the increase would probably be raised to one-half.

And this is but a small portion of what has yet to be accomplished, through the length and breadth of the land, in other towns, and cities, and highways, and byeways, and parish and occupation roads, and over 22,000 miles of turnpikes.

If I have satisfactorily demonstrated that there is yet a large unworked amount of property in the country capable of being brought to use by energy, with a comparatively small outlay of capital, I trust that my words will not fall on dull ears, but that the thought of the brain will grow to be the work of the hand and purse, and that the advent of a new and smaller class of railways will add to the prosperity of those magnificent works that have pierced the whole country as with vital arteries, giving it the boundless wealth that has fought our battles in the great struggle for freedom and human progress.

DISCUSSION.

Mr. CURTIS gave a history of a primitive description of tramway which he had adopted in the West Indies, for removing large timber from the forests, and which could be constructed at about 500 dollars per mile. In the carriage of timber by this means from the forests in which it was felled, it was found that three or four bullocks could do the work of thirty or forty when the loads were carried over the natural surface of the ground. He referred to the system of horse tramway which had been so successfully adopted from Paris to St. Cloud, and also in the wider thoroughfares in several cities in the United States. He apprehended that, as a condition of success, it was indispensable that the wheels of the vehicles should be so constructed as to be able, at the will of the driver, to leave the tramway at any desired point: they should also be of a form not injurious to the ordinary highway. Mr. Curtis proceeded to explain a patent invention of his,* of a composite arrangement of the wheels adapted for travelling on the tramway, and also upon the ordinary highway.

Mr. SHANKS said,—Having often seen the horse railways in the American cities, and travelled by them, he was of opinion that they possessed great advantages over all other street locomotion in point of speed, cheapness, and comfort. In the American cities, which were all built in "blocks" or parallelograms, the chief bustling streets were never used for the horse railways, but the first parallel street was employed, so that the centres of commerce were easily reached by a short walk from the termini. He found also that these railways extended in every direction towards the country where the new streets were formed; in fact, they generally were laid down in advance of the building, so that even the first bricks used were generally carried on these rails. He (Mr. Shanks) was of opinion that they might be advantageously laid down in London in the localities mentioned by Mr. Adams, approaching only to the centres of commerce.

Mr. HOBBS believed the object of this paper to be the improvement of the mode of public conveyance in London, and he thought that anyone who was instrumental in bringing that about would be entitled to very great credit at the hands of the citizens. He did not believe there was a city in England that was so badly off in respect of public conveyances as London. The cabs were the worst and dirtiest that could be found anywhere, and the omnibuses were lumbering, ill-constructed vehicles—bad to get into, inconvenient when in, and as bad to get out of. Looking, however, at all the peculiar circumstances of London, he did not think that the improvement could be effected by horse tramways, especially in the streets of the City, where the traffic most needed relief. He mentioned the extent to which the system of horse tramways had been carried out in the United States—in New York, Boston, Philadelphia, &c.—up to the period of his leaving the States. He particularised the tramway which had been established in New York, extending from the City-hall to the Bowery, Broom-street, &c., thence to the avenues for a distance of about eight miles into the environs. In these cases the streets varied from 115 to 75 and 80 feet in width, and no inconvenience to the ordinary traffic was occasioned. In Baltimore they had tramways leading from the principal streets of the city to the north, south, and west stations of the railways, and these had been found a great public accommodation. In Philadelphia a similar system had been carried out, and also in New Jersey, although in the latter city the introduction of the system was in the first instance opposed by the inhabitants. Notwithstanding the success which had attended the system in the cities to which he alluded, owing to the favourable local circumstances, he had great doubts whether it could be successfully adopted in a city like London, where the conditions were so widely different, both as to the amount and the character of the traffic, as well as the width of the streets. He thought more could be gained by improving the present class of public vehicles than could be expected from the introduction of any other system of transit.

Mr. MARRABLE remarked that in New York the streets were of great width—a condition he saw no prospect of arriving at in London within the next three centuries, at least. There were several practical points in the paper to which he would call the attention of Mr. Adams. He would ask, whether he had considered the effect of his proposed system on the frequent disturbances of the streets for re-laying gas and water pipes? Again, how did Mr. Adams provide for the stopping of the carriages to take up and set down passengers, and how were foot passengers to get out of the way of a succession of carriages running at from ten to twelve miles an hour. At present there was much danger from the vehicles in crossing the streets, and this would be increased in proportion to the increase in the speed of travelling. The difficulty of turning out of the track at any point desired had already been adverted to, in addition to which there was the question of the gradients, as they could not always have the streets upon a level. He thought these were serious objections to the plan, and at present he did not see how they were to be got over.

Mr. FRANCIS BENNOCH agreed with Mr. Hobbs, that any one who could introduce a plan by which the traffic of London could be more conveniently conducted, would deserve not only the gold medal of this Society, but also the thanks of the community at large. It seemed to him that the paper of Mr. Adams did not touch the question they had to consider, viz: by what means they could get the enormous traffic of London from the centre to the circumference, with the least possible difficulty? Mr. Adam's plan did not extend to the centre, and only approached it at Gracechurch-street. He (Mr. Bennoch) would endeavour to show that the difficulties were such as utterly to prevent the realization of Mr. Adams's plan. They had been told of plans for conveying logs of timber through a forest of trees, with the materials for the tram-way at hand; but now they had to cut through a forest of people, a wilderness of bricks, and they could not lay down either houses or people to form the roadway. Again, he thought that to draw a comparison between London and New York, or other cities in the United States, was beside the question. The streets were of magnificent width, and the traffic of a thousand years had been anticipated. But here they had narrow streets and winding sinuous ways, with an amount of traffic almost incalculable. He had devoted more attention to the statistics of London traffic than, perhaps, any other individual not officially interested in the matter. He would point out some of the difficulties in connection with the traffic of the metropolis. It was not a question of the peculiar construction of the omnibuses or cabs, or how notice of their special routes could best be given to travellers. The question they had to deal with was how they could best deal with the general traffic of the streets of London. Mr. Adams's plan only carried them to Gracechurch-street as the nearest point for the City, and he had shown how they might go from thence to Clapham; he had also mentioned other centres, but all these were outside the precincts of the city. How were they to get from that great centre of traffic to the outside and remote points of divergence? He held that the only way of getting from that centre, east and west, was by a railway in connection with the embankment of the Thames. He did not see any other plan. At all events, in his judgment, it was impossible to pass along the crowded streets of London on a tramway. He had had occasion, during the last two or three years, to take an account of the traffic of London at several different points, and it would astonish the meeting when he told them its amount. The largest traffic was across London-bridge; there was nearly one-third more traffic there than in other thoroughfares of London. Second in amount of traffic came Cheapside, which, branching off to Newgate-street and Ludgate-hill, became divided. The next largest traffic was by Holborn-hill and Fleet-street. The fourth in amount was Blackfriars-bridge, so that the traffic over the water, north and south, in the main arteries was as great as that east and west. They might do what they liked, they could not accommodate the existing traffic in combination with that now suggested. If they had the tramways running opposite the doors of warehouses and shops, how was the shopkeeper or warehouseman to get his goods unloaded from the waggon to his warehouse or shop? Trains of carriages would thus become a nuisance—causing perpetual contests, excitement, and stoppages. He held in his hand a statement of the number of vehicles that passed over London-bridge from 9 in the forenoon till 6 in the evening, in 1850, 1853, and 1856.* The largest traffic in that quarter was from 11 to 12 in the forenoon, and from 4 to 5 in the afternoon. In 1850 the traffic in vehicles only over London-bridge, in the 9 hours from 9 to 6, was 10,769; the traffic for the same period of a day in 1853, was 11,498; whilst last year the traffic for the same period of a-day, amounted to no less than 13,119 vehicles, or an average of 1,459 every hour, and these vehicles were so locked and jammed together, that but for the regulations now imposed, London-bridge would be all but impassable. He had personally tested the fact only yesterday, and found that 50 vehicles passed over there in one minute. By what possible means, then, were they to accommodate those passengers who wished to come to and depart from the great city centres of traffic. They had no difficulty as regarded the outskirts—Paddington and such places, where the moving population was small, carriages few, and the thoroughfares wide. The difficulty was here to get to the Bank and back again with facility; and if Mr. Adams could introduce a system to accomplish that end, he would confer a great benefit upon society. At present they had no one fact from the author of the paper as to the traffic of the City and the necessity for its accommodation. Take Cheapside, for instance, and suppose two tramways—one running west and the other east, there would be no room left for the ordinary public traffic. What would become of such traffic as that conducted by Pickford, Chaplin and Horne, &c., which description of traffic—the great commercial traffic of London, was, after all, the great point to be attended to. This was of far more importance to this great commercial city than the transit of individuals who could walk where and how they pleased. If they could not accommodate that traffic, as it now existed, it seemed to him absurd to think of laying down a railway for the accommodation of passengers to and from the City. It was evident that within that magic circle, with the Elephant and Castle, Charing Cross, the Angel, Islington, and Whitechapel Church, they could not enter with this tramway plan, for neither the Strand, Holborn, Goswell-street, Blackman-street, Aldgate, Cheapside, or Ludgate-hill had width enough for the purpose. Outside that circle he saw no great impediment in the way of establishing a system of tramways convenient for those who resided in the environs; and the conveniences of such a system in provincial towns and cities could hardly be called in question. It seemed to him that as regarded London, where tramways were most needed, their introduction was impossible, and where it was possible, they were little if at all required. They might be useful auxiliaries to suburban railways, to places of popular public resort, but not as relieving the traffic that had become too gigantic for the narrow streets of London. In no other city of the world was the population so dense or the thoroughfares so crowded as in London, and no just comparison could be therefore instituted between this and any other city. Even in Paris the illustration of the tramway to St. Cloud could not hold good. It was only suburban traffic. They might carry the system with perfect ease along Rotten-row, so as to interfere with neither the carriage nor pedestrian traffic; and he saw no obstacle to prevent its adoption by the New road, round the outskirts of London; but to give convenience to the great masses of the inhabitants, he held it to be impossible, except as he had before stated, in connection with some grand scheme for the embankment of the Thames. By that means they might have a system of perpetual tramways and steam boats, and thus permanently relieve the overcrowded streets of the City.

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* Letters Patent, No. 894—1852.

Mr. Henry Cole, C.B., thought Mr. Bennoch, in endeavouring to bring others to the point, had wandered from it himself. He apprehended the object of the author of the paper was to discuss how far tramways were desirable wherever facilities existed for their introduction — without any special reference to the city of London. Mr. Bennoch had alluded to the state of things in Paris; but they must take the facts as they found them. Many gentlemen present had seen the railway from the Champs Elysées to St. Cloud, and had probably travelled upon it with comfort and cheapness, and he saw no reason why the same system should not be adopted for the convenience of the inhabitants of London, in such localities where (as was the case in Paris), there were facilities for its introduction. Mr. Bennoch appeared to regard the question as one peculiarly affecting the city: such, however, he apprehended was not the idea of the author of the paper. It might, with some force, be argued that the steam-boats, running on the river, were of no use to persons wishing to go to the Bank; and, in like manner, the argument might be extended to the Greenwich boats, or the London and South Western, or any other of the metropolitan railways. They do not take people to the Bank, or into the heart of the City. The gist of the paper was, that a system of railways, other than those worked by locomotives, was applicable to the traffic of London, and that was a position which had been proved practicable in Paris. If they wanted such a means of transit to the Crystal Palace, for example, and they started from Blackfriar's-bridge, was it of no value because it did not lead to the Bank? Whether due provision could be made for the accommodation of the heavy commercial traffic was another question, which he could not enter upon, nor wa he competent to express an opinion on the engineering part of the question. He agreed with Mr. Bennoch, that if they looked at the great question of the general internal traffic of London, it must be in connection with the embankment of the Thames. Every one who traversed the river must be struck with the facilities there presented for converting the noisome mud-banks into a grand highway. It was marvellous to see capital seek-

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* Traffic over London Bridge.

	1 day in 1850.	1 day in 1853.	1 day in 1856.
	Vehicles.	Vehicles.	Vehicles.
9 to 10 o'clock..	1,128	1,311	1,220
10 ,, 11 ,, ...	1,332	1,248	1,574
11 ,, 12 ,, ...	1,224	1,373	1,625
12 ,, 1 ,, ...	1,094	1,288	1,465
1 ,, 2 ,, ...	1,058	1,185	1,455
2 ,, 3 ,, ...	1,101	1,092	1,282
3 ,, 4 ,, ...	1,180	1,265	1,451
4 ,, 5 ,, ...	1,344	1,426	1,545
5 ,, 6 ,, ...	1,308	1,310	1,502
	10,769	11,498	13,119

ing its development in every quarter, whilst that great scheme of embankment was allowed to remain at rest; and it was surprising that there was no dominant will to say, We will turn this to account, and improve both the river and the facilities for the vast traffic of London. If Mr. Bennoch had a mission to advocate—the embankment of the Thames—he (Mr. Cole) was sure he would meet with a hearty concurrence from this Society, and then they might entertain Mr. Adams' plan of tramways also. If they could only get a tramway from St. James's to Kensington, or any places of great public resort, he thought it a matter not unworthy their notice.

Mr. Vignoles remarked that the question of the embankment of the Thames was one in which he had no doubt they would all concur, but there were a vast number of interests—which in this country they were accustomed to regard—to be consulted, as well as engineering considerations of the utmost importance, such as the question of the flow of the tide, and other matters, which would have to be settled before the dominant will could carry that scheme into operation. After due discussion of these points, he had no doubt they would arrive at an unanimous opinion in favour of the embankment of the Thames, as affording a better mode of access through London. There was no person who admired more than he did the talents of Mr. Bridges Adams. There were very few engineers in the present day who had not in some way or other benefited by his vast energy, his indomitable perseverance, and the liberal manner in which he had dispensed his ideas, and devoted his health and fortune to the advancement of the mechanical details of railways. With respect to the practicability of the plan, no doubt it was perfectly practicable in itself. The result in Paris was a sufficient proof that such a thing could be done, and that it could be done in thoroughfares of moderate width, so as not to interfere with the ordinary traffic. It certainly could not be attempted in the heart of the city, but in the outskirts it could. Indeed, it had already been done along the Commercial-road, where it was continued up to Church-street, Whitechapel, at which point the road was too narrow for its further extension. The same system had been adopted throughout the whole extent of the docks at Liverpool without interference with the other traffic of the locality, and whole trains of waggons were conveyed by that means; therefore, the practicability of the principle must be admitted. But there was another element which, he thought, had not been sufficiently adverted to. It was not enough to have a railway, but they must put rolling stock upon it, which involved in some degree a change in the particular mode of conveyance; and before the public would fall in with the new system there must be a sufficiency of rolling stock to afford the same accommodation to the public as at present existed. That, he thought, would prove the real stumbling-block to the successful introduction of this system of urban railways. because, to get a large trade there must be accommodation afforded at the very moment it was required. This would involve a considerable amount of capital for rolling stock. With regard to the cost of the road itself there were a great number of points to be considered. One gentleman had alluded to the gas and water pipes. Such a question was more pertinent to London than to any other place, and reduced itself into a question of annual expense in the way of maintenance, for he doubted whether Parliament would sanction the imposing upon gas and water companies the additional burden of repairing the railways as well as the highways which they disturbed. He doubted whether the system could be carried out without the sanction of an Act of Parliament. The cost of the road, taking the experience of Liverpool and Paris, he thought would be beyond what Mr. Adams had put it at; but, after all, it would not be very considerable, though the cost of maintenance, he thought, would be an item of some importance.

Mr. M. H. Perley said, he was in the habit of visiting many of the large cities of the States, and had freely availed himself of the comfort of horse railways in New York, Boston, Philadelphia and Baltimore; and he was sure those who had travelled by the horse railways would not wish to go by any other mode of conveyance. It was quite true that these railways could only be used in such situations as not to interfere with the other traffic in the streets. The carriages in New York ordinarily conveyed twenty-four persons inside. The streets of Boston more resembled those of London as to width, than those of New York or Philadelphia, but the system had been successfully introduced there. With reference to keeping the track clear, he thought the difficulty was greater in America than would be the case here, because of the greater quantity of snow; yet he could state that the horse railways had continued to work when the other vehicles had been stopped by it. In fact, in all respects, these horse railways had been found a great convenience.

Mr. Aston said, that as far as his experience, during a short visit to the United States, enabled him to form an opinion, he thought the system of street and horse railroads appeared to answer admirably there. He had seen them at work in streets that were not very wide, and where the difficulties of ascent and descent were easily overcome, and where sharp turns round corners were made of little account. With regard to two main objections, which had been stated as operating against their introduction here, the difficulty of providing for frequent stoppages, and the danger of turning round sharp corners, the first was overcome in America by the use of powerful brakes, which placed the common street cars, and even large railway cars, containing sometimes as many as sixty passengers, perfectly under the control of the conductor, who could stop the vehicle in a short time, even when on a moderate descent. But it was not always necessary to stop the car; the motion was so even, the cars so roomy, and the steps for descent so well contrived, that a passenger might alight with safety while the carriage was in motion. Indeed he (Mr. Aston) had done this himself when in New York. With regard to turning sharp corners, the flanges of the wheels ran in grooves, and, on turning a corner, the outer groove was replaced either by a flat plate or a raised tramway, so that the off-wheels of the car ran on their flanges, and were, more or less, raised according as the sharpness of the turn rendered it desirable. This inward inclination of the carriages counteracted the centrifugal tendency of the weight, and so the balance was preserved. He (Mr. Aston) quite agreed with what had been said about the comfort and convenience of the roomy carriages, as used in America. For ladies they were all that could be desired, and there was no doubt but that, in this country, the unfortunate "unprotected females" would find great comfort from the adoption of a system which their Transatlantic cousins found so convenient.

In reply to an inquiry, Mr. Hobbs stated, that the gradient down the Bowery in New York was about the same as that from Charing-cross to the Horse-guards.

Mr. Lacey thought very highly of the plan for working small branch lines of railways, but questioned the possibility of its introduction in crowded streets. He saw no reason why such a road should not be carried from Westminster-bridge, or any other of the bridges, to the Crystal Palace: but he thought it could be done only under the sanction of an Act of Parliament.

Mr. Hyde Clarke reminded Mr. Adams that the Whitby and Pickering Railway was worked by horses, as well as several of the German lines, until a higher speed was required.

Mr. Bridges Adams, in reply to the observations advanced, said it had never been contemplated by him to cover all London at once with this system of railways—nor did he think it practicable to introduce them into narrow thoroughfares, although perfectly practicable in some localities. He thought, as regarded the traffic of

London, they would ultimately have to make streets on the first floor—the first floor for the light traffic, and the lower level for the heavy traffic. With regard to the railway itself, he looked upon it only as another mode of paving, and a strip of iron rail passing down a street would occasion no more obstruction than the iron gutters through the pavement to carry off the water from the houses. With regard to the rails, there was no occasion for a deep channel—a very small one would suffice to keep the wheels in their place. He believed the plan needed only to be seen in operation to be appreciated, and his object in the present paper was to draw attention to the subject. He thought it desirable that it should be tried over a short distance, and when proved to be practicable there would be no difficulty in following it up. He saw no reason why the experiment should not be tried in such thoroughfares as Oxford-street or Holborn. With regard to stopping the carriages at any required moment, there was no difficulty in adopting mechanical appliances to effect that object. He thought the rails ought to be laid upon the simplest plan, so that a length requiring to be replaced could be removed with facility. He thought the cost of repairs would be small. The load upon the rails would be so much less than that on ordinary railways, that the abrasion of the rails would be very slight indeed.

The Chairman said they were very much indebted to Mr. Adams for having brought this subject forward. There was no doubt it was an important subject, and one on which much difference of opinion would naturally exist, but he thought they could not fail to be struck with this fact, that the state of things in a comparatively new city like that of New York, or in a new country like the United States, was very different to that which existed in this metropolis. Nevertheless they ought to take a lesson from their American friends with regard to these horse railways and the carriages on them as well as with regard to the way in which these tramways were connected with the locomotive lines. Such an experiment might be very fairly tried from the Strand over Hungerford Bridge to the South Western Railway, to which he would direct the attention of his friend Mr. Lacey. He agreed with Mr. Bennoch that the effectual relief of the great traffic of London would be found in the embankment of the Thames. He hoped this would not be the last occasion on which this subject would be discussed by this Society. It was one to which they might turn their attention with advantage, and he hoped before long they would see some means adopted by which the communications between the metropolis and the suburbs might be materially improved. He begged to propose a vote of thanks to Mr. Adams for his paper.

A vote of thanks to Mr. Adams was then passed.

The Secretary announced that on Wednesday evening next, the 18th inst., a Paper by Mr. J. N. Hearder, of Plymouth, "On a Powerful Modification of the Induction Coil and some New Electrical Phenomena Developed by it," would be read.

EXAMINATIONS OF THE SOCIETY OF ARTS.

(From the *Daily News.*)

The Registrar-General, a public functionary who tells the most astounding truths with a provoking calmness which is to the last degree irritating, has just made us acquainted with the fact, that the natural increase of the population last year "was probably at the rate of 1,000 a day." Of these increments to the population it may be doubted whether one in a hundred accomplished the feat of entering the world with a silver spoon in its mouth, signifying that its rich soup was already prepared in advance, and that it was provided with all proper means for sipping it with decorum. A larger proportion might possibly have come furnished with wooden ladles in anticipation of a plentiful supply of modest porridge awaiting them at life's table. A great majority, however, were ushered into the world with their mouths unfurnished even with teeth. These will in after life have to look sharply around them to get either soup or porridge, and it must depend upon their own energies and training whether they are ever able to pick up crumbs enough to strengthen them for the battle of life. In other words, of the thousand human beings who were added to the population this morning, the vast majority will have to battle hard to obtain a living.

Now, it is pretty nearly agreed upon by all parties, that mere energies will do as little in the metaphorical battle of life as in any real battle. Energies are nothing unless they are disciplined and trained. Our spoonless and ladleless population will only have a chance of obtaining either spoons or ladles by groping painfully in the mud, like the *chiffoniers* at Paris, unless they prepare themselves for something higher. And as ninety-nine out of a hundred of your *chiffoniers* never light upon a spoon or a ladle in the gutters of society, in spite of the most anxious search, they occasionally endeavour to supply themselves with these articles in a manner that is scarcely consistent with a proper degree of reverence for the eighth commandment. In other words, they lay society under contribution for their support. So that of the thousand British subjects who have made their entrance into the world to-day, there is no knowing how many may be occupied this day twenty years in garotting by day and committing burglary by night, unless you furnish them by education with the means of playing a more decent part in society. All parties are tolerably well agreed upon this point. Conservatives and Liberals, pious men, and men of the world, nobles and tradesmen, all concur in asserting the absolute necessity of national education. You cannot take up a daily newspaper without seeing overwhelming testimony to the magnitude of the need, the universal conviction that something must be done. Take the other day's *Daily News* as an example. We read there of the Bishop of London, Mr. Gladstone, Mr. Maurice, and others, declaiming on education at Stepney. We learn that on Friday an Educational Conference took place at the Athenæum, Manchester. Finally, we hear that Dr. Booth has been addressing the guests at a large Soirée held in the Hall at the Mechanics' Institute at Nottingham, on the subject of the Society of Arts' Examinations. We might almost be induced to suppose that grown-up people were subscribing heartily to the belief in the proverb to which they listened rather impatiently in their childhood:

> When house and lands are gone and spent,
> Then learning is most excellent;

and that the Latin dictum *Rem quocumque modo Rem* would be translated by "Education at any price."

But in spite of the universal feeling in favour of a national education we are as far from it as ever. The Voluntaries denounce fiercely the system of government grants. The advocates of state education sneer at the assertion that education on the voluntary system is possible. The friends of religious education treat the friends of secular education as heretics, and the latter accuse their opponents of imbecility. If the whole nation were to agree to-morrow that it was expedient that education should be undertaken by the State, a generation would be born and die before the details could be agreed upon. We doubt whether it would be possible to form a cabinet of efficient men who would agree upon a definite plan of state education. The Committee of Council itself may be regarded as a standing proof of the impotence of government in the matter of education. Almost the whole of its operations are confined to the assistance by grants of money of private and local efforts, and the appointment of inspectors, whose duty it is to see that he purposes for which the grants were bestowed are carried out. The object of the Committee of Council is not to educate, but to assist those who are engaged in education. And this is the limit of the agency with which government will be entrusted in the matter of education. And, even if there were a desire to give the government rather more power, there is every possibility that fear of the consequences would deter the public from fulfilling the desire. The government, as recent events have proved, seems to have lost the power of organisation. It plunges rashly into enterprises of moment without any knowledge or skill, content to gain information by the rough process of loss and misfortune. The great movements of the time, such as the reformatory system, have taken place outside of government, which is content with the subordinate part of assisting, by money and protection, the development of that which has originated elsewhere.

It is not, therefore, to be wondered at that education should not form the subject of a special notice in the Queen's Speech. The educational bodies are, in many instances, doing their work well, and it would be a pity that they should be interrupted, at least at present, in their operation by a government measure. At the same time, it would be as well that bodies which are working without any bond of co-operation, any feeling of union, should have some common centre to which their labours might tend. A centralisation which should make all these bodies travel precisely the same road would be mischievous, but such a want of system as would make them naturally diverge would be worse. If there is no union amongst our educational institutions, there should at least be unity of aim. Although the methods may be different, the end should be the same. And this can only be attained by instituting a universal system of examinations, by which the qualifications of pupils educated in all classes of schools may be tested. This is precisely the system adopted in our great Universities. The pupils are educated in different colleges, under different systems, by different tutors, but they are all bound at the termination of their course to undergo the University examinations.

The only attempt to do for the pupils of the ordinary schools of the empire what the University do for the students in the colleges has been made by the Society of Arts. They have instituted examinations at which, under certain restrictions, pupils from the lower and middle-class schools may attend and have their qualifications tested. Certificates are granted to those who pass satisfactory examinations. The need of such a system was shown, previously to its being put into action, by the fact of a declaration being signed by a large number of merchants and manufacturers, stating that they should consider the possession of the Society's certificate by an applicant for a situation as a valid testimonial. The same thing was shown by the immediate adhesion to the plan of a great number of the most distinguished friends of education of all religious parties and of all sects. These persons, who would have debated for a quarter of a century without coming to any satisfactory conclusion as to the establishment of a system of education, were not only willing, but eager to join a plan having for its object the application of a test of the value of the results of education. It may or may not be a question for discussion whether children should receive religious instruction under the same roof where they prosecute secular studies, but there can be no doubt that it is expedient to know whether this secular education has or has not been a sham. The best test of the reality of this education is an examination. And this test may be applied with more impartiality and accuracy by parties who have not been concerned in the education of those they examine than by the educators themselves. If the Society of Arts can extend their operations, hitherto conducted with so much success, throughout the whole of England, they will have gone far to establish a middle-class university. Detached from the processes of education, and only occupied with testing its results, they will be looked upon without suspicion by all sects and denominations. The inducements they hold out to masters and pupils to exert themselves will have the effect of stimulating education in a remarkable manner. They will do this without requiring grants for school-houses or professors. If, however, they wish to steer clear of difficulties, they should preserve their present freedom from Government control. At present they have the confidence of the country; if they surrender the management of their scheme into the hands of Government, the public will involuntarily think of jobbery or disorganisation. They have obtained the confidence of the public by their intelligence and independence. If they give up one, the public will be loth to give them credit for the other.

THE SOULAGES COLLECTION.

After having been submitted to public criticism at Marlborough House since the 7th of December, the exhibition of this collection was closed on Saturday, 7th of February. During this period it has been visited by upwards of forty-eight thousand persons, which is just double the usual numbers attending at this season. Among these visitors as many as five thousand one hundred and twenty-six persons have paid for admission, being ninefold the average numbers paying. It is understood that the offer of sale has been made to the government for £13,620, with the recommendation that, if bought for the nation, it may be sent to Manchester.

The following is the report of the committee appointed by the council of the Royal Institute of British Architects to examine the Soulages Collection, and report their opinion whether it would be expedient to recommend its purchase by the Government:—

"The enlarged views in regard to architectural decoration which have recently revived the taste for ornamental design that some centuries ago was so prevalent in England, render it necessary for the architect of the present day to enter upon new fields of study, to seek for new sources of inspiration, and to acquaint himself with all the formulas of conception to be found in the productions of other branches of science and art than those which are directly structural, in order to qualify himself to take that lead in directing public taste which his position and vocation call upon him to assume. It is indisputable that in every age the sources of design for all classes of manufacture have been identified with the productions of the architect, and frequently derived from his conceptions. Among the ancients the fictile vases and the bronzes may be quoted in illustration of this fact as constantly borrowing their ornaments from the buildings of antiquity; and in the mediæval period the pillars, the buttresses, the carving, the panelling, and architectural divisions, all of which were applied to fittings of every description, were adopted from the structural details of the edifices, often with little or no reference to material or other proprieties of adaptation.

"As the architect's development of the artistic element is the highest applicable to the common purposes of life, it is obvious that the revival of obsolete sources of decoration demands the utmost circumspection. To acquit himself conscientiously of such a responsibility he must neglect no means of information—he must underrate no style, no object, no department, which may contribute to those harmonious effects which it is his province to endeavour on all occasions to insure. He must enter upon a new career of thought, and acquaint himself with the history and fluctuations that have distinguished each phase of the origin, development, and decay of every class of applied ornament; so as to adopt it with propriety, taste and originality, as an ever fresh idea, and not as a mere 'rifacciamento' of existing forms.

"Collections like those of M. Soulages and of the late

Mr. Bernal are of the utmost value to the architect, reflecting as they do the arts, manufacture, skill, and taste of various countries and periods; and showing their application to the ordinary uses of life in the several grades of society. No less remarkable are they when set in contrast with the industrial practice of the first quarter of the present century,—a period of singular barrenness in technical design, since they serve to bear only a more vivid testimony to the extent to which art was applied in the most trifling and ordinary utensils and objects, during those palmy days of Italian grandeur when were executed the majority of the specimens of which those collections consist. During such periods the sentiment of art would appear to have been absolutely necessary to commend the productions of the skilled mechanic to general acceptance. And it is remarkable to observe that taste never became the exclusive property of any one department or class of productions, but reigned an universal element, the decline of purity in any manufacture being but the sign of a general and concurrent deterioration in every other. Such collections represent a worldwide school, in which to form an universal rather than a particular standard of national taste; and thus the student is freed from the trammels of that confined view of style which the traditions of any one period, limited within a narrow geographical circle, would bind around him. France, Italy, Germany, and England, have furnished their quota of excellence in many ways to the specimens now brought together in Marlborough-house; and from the very distinctive peculiarities which characterise the various productions, a wider field is afforded for the wares of the manufacturer of the present day, fresh tastes are excited, and an earnest longing is created in the purchaser for the possession of more refined and excellent productions; raising them above mere mechanical results, enlarging their sphere of application and necessarily stimulating production.

“There can be little healthy progress in national manufacture so long as the commonest and mere material wants only have to be satisfied; but directly cultivated taste seeks for superior execution and more refined elegance, enterprise and skill are enlisted in the gratification of those tendencies, progressive improvements constantly arise, industry and commerce gain by the movement, and the material prosperity of those engaged therein necessarily follows.

“ Enamels.

“ There are many arts which once flourished in this country, and which have been applied only in a very limited manner within a century or two, while there are others which have never received in Great Britain the development of which they are capable, and which in other countries have been productive of very important results. Enamelling was at one time extensively used in England, as we may see on the metallic monuments in Westminster Abbey, some of the recumbent figures of which were covered with elaborate ornaments of this nature, as also the heraldic shields occasionally inserted in brasses. It is now almost entirely confined to smaller works of the jeweller's craft, or elaborate reproductions of choice pictures and portraits; whereas in the Bernal and Soulages collections are to be found medallions and plates of considerable dimensions, and the art applied to tazze, inkstands, and salt-cellars, enriched with most delicate arabesques and historical subjects. Such specimens give renewed hope that we may ultimately realize at moderate cost the process of enamelling on slabs of lava, brought under the attention of this institute some years since by an honorary and corresponding member, M. Hittorff, now president of the section of fine arts of the Institute of France, or medallion portraits of a nature somewhat similar to those introduced in the *façade* of the Academie des Beaux Arts at Paris by M. Duban. There seems no reason, if public taste afforded the encouragement, why enamelled panels might not be successfully introduced as an architectural decoration, durable as to material, brilliant in colour, and unchangeable in effect. A notable instance of such an application of enamel existed in the famous Chateau de Madrid in the Bois de Boulogne, Paris, which has been the theme of praise by all writers who have mentioned it. The *façade* was adorned with enamels 5 feet high by 3 feet 4 inches wide, nine of which still exist in the Hotel de Cluny.* Were such panels capable of being multiplied at a moderate cost, we might from time to time introduce in our buildings a series of all but imperishable portraits of our sovereigns, of eminent men and historical characters; not, as in past times, confining the subject of such enamels to the twelve Cæsars, the labours of Hercules, or such pedantic abstractions, but adopting themes from our own poets, writers, and historians; and these would come more home to the feelings, and commemorate for popular honour and respect those celebrities who have illustrated our own history, and have rendered eminent services to our country.

“ Medals.

“ Medal die engraving is at present of very restricted application, being generally limited in this country to too small a class of objects; and little patronage is bestowed upon what was among the ancients, and after the revival, a most important department of art production. The medals and coinage of antiquity are upon a par with the productions of Phidias, Lysippus, and Praxiteles; and the coins of Sicily and many towns of Greece, the medals of Alexander and his successors, as well as the Roman Imperial series, reflect the genius of the brightest eras of antique taste and skill. Of scarcely inferior merit were the Italian medals; and the medallions of various sizes—whether cast or struck—of the 15th and 16th centuries are full of intense meaning, handing down to us, with the utmost vigour and refinement of expression, the lineaments of the great, the noble, or the illustrious of those periods.

“ Of such gems the Soulages collection contains 106 specimens, chiefly of Italian and French art, struck or cast, presenting many varieties of treatment, and suggestive of an useful application of such memorials in modern times, combining valuable æsthetic results with historical records of an almost imperishable nature.

“ Glass.

“ The brilliant progress which has been made in the manufacture of glass in this country within the few years that have elapsed since the removal of those fiscal restrictions which arrested all improvement and threw this country behind others invests the articles of this class in the Soulages collection with great interest. Without entering into the technical processes of the ‘laticino,’ ‘vitro di trina,’ ‘millefiori,” ‘aventurine,’ and ‘schmelze,’ some of which are already practised in England, we may at once confidently predict that the study of choice specimens like those presented to view in Marlborough-house will lead to the development of new combinations, which will some day distinguish our English manufactures as much as, if not more than, their Italian or Bohemian predecessors. The rapid advance in the scientific manufacture of glass, and the new applications of that material which have recently been brought to light for the supply of architectural requirements, are alone sufficient to convince us that this art is capable of the utmost development through English enterprise.

“Bronzes.

“ The 106 objects in bronze comprised in the Soulages collection illustrate a class of manufacture hitherto of very limited application in England; whereas in her Eastern dependencies the artists in bronze for centuries past have produced, even in common utensils, elegance of form and unrivalled decoration in metallic inlay. This latter elegant process, which was of essentially Oriental origin, was eagerly adopted by the Venetians, and reproduced in their Damascened ware.

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* It is said that some were purchased by Englishmen, and are now in this country. It would be a great service to the arts if they could be discovered, and exposed in the Great Exhibition about to be opened at Manchester.

"Tens of thousands of French artisans are maintained by their skilful treatment of bronze, now an essential article of furniture in that country, and purchased with avidity in England and, indeed, throughout Europe and America. So unpractised are our founders in the successful casting of such delicate objects, and so deficient are we in educated chasers and finishers, that we have to depend mainly on foreigners for the supply of small bronzes. Their production by English manufacturers is, indeed, so costly that the Art-Union of London (who for many years devoted much attention to the subject, and at great expense brought out various statuettes and busts), anxious as that body are to encourage the art, have been almost compelled to abandon the attempt to any great extent, and only persevere under the most discouraging circumstances. The beautiful works of art in bronze, so abundant in Paris, find no rivalry here. And we feel, therefore, that the acquisitions of the specimens in this collection, although far too limited for the urgent necessity that exists for the supply of good models in this branch of industry, would be desirable, as tending to draw public attention to this important and neglected branch of art manufacture. We do not venture to class them in design or execution with the matchless productions of antiquity, such as those preserved in the Museum of the Studii at Naples, or even with modern ones of the highest class of art; but still there are many objects gracefully composed, elegant in form, and especially suggestive of improvement in those departments of domestic economy into which they might be introduced with propriety.

"Decorative Furniture.

"There are 100 pieces* of furniture and textile fabrics, consisting of chairs, cabinets, coffers, tables, buffets, dressiors, metallic mirrors, a magnificent lantern, the cornice of a room, three pairs of bellows of tasteful design and execution, and an elaborate chimney-piece. These present a store of useful and applicable articles of various merit. Some few are carved with considerable skill, others are distinguished for their general design or graceful proportions. Some have been considerably repaired or modified by inferior hands, but others remain intact. The buffets and armoires are suggestive, and admit of easy application to our present uses. The chestnut-wood coffers, the marriage-chests of Italian history and romance, have evidently originated in a superior class of artists, and the metal mirrors, with their carved frames, are graceful illustrations of a curious variety of domestic utensils. In all these articles it is necessary to discriminate between the production of the manufacturer who repeats, and the treatment of his material by the artist who originates. We may still be enabled to recognise clearly those forms and expressions of original ideas, vulgarised by the common taste of those who repeat or demand repetition; for, although coarse in parts or gross in detail, they may still retain some of the elements of that antecedent period when livelier imagination, more refinement, and truer sentiment prevailed. The textile fabrics contain some very elegant ornamented patterns, and several curious specimens of embroidery.

"Majolica.

We have reserved for our concluding remarks the most numerous and most important section of this collection —namely, the majolica, and enamelled earthern and stone wares, consisting of 168 pieces.† We shall not enlarge upon the mutual relations of art and material, nor upon the extent to which all branches of fine art are influenced by the materials employed. This is especially perceptible in the earthenwares of Greek art and majolica, in contrast with the porcelains of Asia and Europe, and their works in this class are as distinct as the earths of which they are composed. Nor do we pretend to review the various processes of manufacture, nor the mysteries of the glaze and brilliant lustres which give so much attraction to these admirable productions, such as the metallic reflexions, the changing colours, the mother-o'-pearl of Gubbio, Urbido, Pesaro, Caffagiolo, Faenza, Castel Durante, or of other towns or States of Italy, where the enlightened patronage of the dukes and princes to these wares realised a reputation that could hardly otherwise have been acquired by places of such secondary importance. The earlier pieces of majolica retain much of the noble simplicity of form and richness of decoration of their Hispano-Moorish origin; and the later ones have a higher aim than the porcelains of Germany and France, whose art decorations occasionally present a fantastic and capricious application, and generally a minute and highly-wrought elaboration by superior artists, almost too precious for the frail material upon which it is bestowed, limiting the products to the tables only of the most affluent.

"The majolica, on the contrary, admits, when once the design is settled, of a rapid execution by practised secondary hands; by this economy in the production most carefully designed objects may be brought within the means of the humbler admirer of art. This series includes some choice specimens* of Bernard de Palissy's skill, and embraces every class of object fitted for the table, or to adorn the buffet or dressoir; such as plateaus, plaques, vases, plates, fruttiere, tazze, trays or baskets, cups, flasks, bowls, ewers, sauceboats, saltcellars, and other articles. The finest of these are grouped in one case, and constitute a series of the highest æsthetic value, as regards their form, the combinations of colour, and treatment of decoration. They are available as types, or may be considered educationally as specimens to be followed, improved, or varied; there is not one which is not valuable for the one or other purpose. The success may be problematical of any attempt to derange the predilections and established favour with which the public have been accustomed to regard certain articles of use in common life; but we believe that the public mind is prepared and anxious to adopt a higher state of art-treatment in such objects.

"Without advocating for a moment a blind adherence to any of these forms, or the modes of decoration which distinguish these works, in which occasionally the execution may not rise to the dignity of the subject—in which extravagance may now and then have usurped the place of good taste, and in which noble forms may be here and there applied to inferior uses—we may clearly recognize so much that is noble and brilliant, so much that is full of feeling and expression, and such an appeal to a higher intelligence as to warrant our maintaining distinctly that access to such examples must improve the taste of the people, and elevate the aspirations of every mind for something better than those we already possess. This consummation we are indeed justified in prognosticating (from the successful efforts in majolica made by the firm of Minton for the Paris Universal Exhibition of 1855) our own countrymen on the banks of the Trent and the Severn are fully able to attain. From those exertions we may reasonably contemplate that, in a few years by the teaching aid of such examples as those contained in the Soulages Collection, by the union of manufacturing skill in the manipulation with artistic power in the embellishment, and by due encouragement from the public, majolica will become in this country a most attractive and very important branch of art production, and eventually compete with the ceramic works of any period and of any country.

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* Artistic in general effect are 660, 670, 691, 693. Nos. 655, 656, are to be praised for their design and execution; and 670, 671, for exquisite design and workmanship.

† Very satisfactory in point of design are the arabesques around Nos. 1, 2, 4, 5. 7a, 7b, 7c, 28, 29, 35m, 38, 38r, 41, 43, 15k, 15h, 15l, 66, 72, 75, 76; and in form as well as in decoration, 86, 88, 92, 105, 108, 110; and as works of real art, 3, 6, 8, 9, 82.

* Very high in style of conventional ornament, in design execution, and effect, are 138, 142, 143, 144.

" In conclusion, we have to report that we are unable to contemplate, without the deepest regret, the possibility of such a collection being broken up and scattered into various channels. Each individual piece has its own peculiar value or merit; but when combined with others, as illustrating either the theory or history of art, so as to complete the chain and connexion of manufacture and art illustration, and thus forming a series of the progressive excellence to which such productions have been carried in times past, their worth is much enhanced. If Government were to rely upon the chances of a sale they would probably be outbid for the best articles by wealthy individuals, who will gratify a taste at a fancy price, and thus the museums of the nation would have in such an event only the chance of obtaining secondary articles, purchased at greatly enhanced cost.

" In making this report the committee have deemed it more advisable to submit their opinions, based, after a careful examination of the objects, upon a broad and general consideration of their importance as a whole, and as a commencement and very desirable contribution, with the series obtained from the Bernal collection, towards a large and complete historical and artistic museum, rather than a minute criticism of any individual specimens. And they have come to the conclusion that it would be an irreparable loss of a great opportunity to improve our manufactures, to enlarge the sphere of art application, to increase our commerce, and to instruct the public mind, if the Government did not accept the offer to sell the whole to the nation at cost price—an offer so nobly made by the disinterested and public spirited men who, with singular generosity, and on their own responsibility, have at all risks afforded the opportunity to the country of securing the collection in its entirety.

" T. L. Donaldson, Chairman.
" S. Angell.
" A. Ashpitel.
" Talbot Bury.
" Benj. Ferry.
" E. I'Anson.
Jan. 1857.

" T. H. Lewis.
" A. Salvin.
" G. Vulliamy.
" T. H. Wyatt.
" C. C. Nelson } Hon.
" W. D. Wyatt } Secs.

Proceedings of Institutions.

Nottingham.—The annual *soirée* of the members of the Mechanics' Institution took place on Thursday, the 29th ult., in the great hall of the Institute. The chair was taken at seven o'clock, by Mr. J. E. Denison, M.P., the president of the Institution, who was supported on the platform by Mr. J. Walter, M.P., Mr. C. Paget, M.P., Mr. W. H. Barrow, M.P., the Rev. Dr. Booth (who attended from the Society of Arts), W. Enfield, Esq., the Mayor, Rev. S. McAll, B. Campbell, Esq., L. Haymann, Esq., and other gentlemen. The Chairman, in opening the proceedings, said, the town of Nottingham had been vastly increasing, but the question was, had the means of instructing the people kept pace with the increase of their numbers, and as far as this Institution was concerned, had it done all it could in its sphere to promote the advancement and instruction of the people. This was, perhaps, not the most suitable occasion for discussing the general question of education. He could not, however, avoid alluding to one measure, which provided that it should be in the power of the guardians to provide the poor children belonging to recipients of out-door relief with education. He was glad to find that this was being adopted. After speaking further upon the general question of education, he called upon Mr. W. H. Barrow, M.P., who proposed the following resolution:—" That this meeting, whilst it rejoices at the progress lately made in the cause of education generally, feels the necessity of continued and well sustained exertions to meet the growing and widely-spread demand of a rapidly increasing population." This was seconded by the Rev. S. McCall, and carried unanimously. Mr. J. Walter, M.P., proposed the next resolution:—" That as Mechanics' Institutions form an important means for the spread of knowledge, intelligence, and improvement among the people, it is expedient, by wise and judicious management, to adapt them to the requirements of the times, and thus render them worthy of extended encouragement and support." He would read to them the evidence given some years ago before the Parliamentary committee, of which he was a member, by a gentleman named Warren, originally a working man, who attributed all the good he ever attained in his life mainly to his accidental connection with the Manchester Mechanics' Institution. Mr. Walter read extracts from the evidence of Mr. Warren, who, it appeared, was first struck by hearing a lecture on astronomy by Dr. Lardner, delivered in the Manchester Mechanics' Institution; and to the impetus produced by the impression which this lecture had on his mind he ascribed his subsequent advancement in life. Mr. Warren considered that the great value of Mechanics' Institutions was in directing the minds of working men to subjects which it would be of advantage to them to pursue. Mr. Walter observed, that if these institutions were to influence the working classes they must search out the working classes by connecting themselves with the schools of the working classes, for it was impossible that one central Institution could meet the wants of totally unlettered men, since it was only those who had received a certain amount of education who were capable of availing themselves of the advantages of these Institutions. He had a strong feeling that these Institutions, as generally conducted, had depended too much upon attaining an unnecessary popularity by the miscellaneous character of their lectures. A good library he considered to be the necessary basis of an Institution of this kind, and next to a good library he believed that classes for mutual instruction might be very beneficially adopted—classes, for instance, in which might be taught modern languages, mathematics, and other branches of art and science in which the working classes were most concerned. He (Mr. Walter) did not deny the advantage of lectures, but he thought that the conductors of these Institutions should obtain the services of men who were professionally devoted to that branch of literature, instead of seeking to attract an audience by the popularity, perhaps, of a member of Parliament, or some literary man, or any gentleman in the neighbourhood who might be, perhaps, good-natured enough to expose himself to the criticisms to which the *dilettante* lecturer was often very justly liable. Mr. G. Paget, M.P., seconded the resolution. He thought if employers of labour made it a rule to prefer the man who could read and write, the working classes, finding that a value was set upon that accomplishment by employers, would begin to set a value upon it themselves, and would be stimulated to obtain instruction. It appeared to him that persons who employed men in whom mechanical knowledge was valuable might very fairly attach importance to a certificate of attendance upon mechanical classes in connection with institutions like this. Certificates might also be given to those who had attended the classes of modern languages, and no doubt such testimonies of proficiency in one or more continental tongues would be a valuable recommendation to clerks and others of that class. The hon. member then described the half-time system pursued, under his auspices, in the parish of Ruddington. His plan was, instead of employing four boys to employ eight, and on alternate days half of them worked in the field, and the other half of them went to school. Not only was their work done better and more cheerfully under this arrangement, but, according to the testimony of the schoolmaster, their progress in instruction was almost as great as if they were kept at school the whole of the week without intermission. In conclusion, Mr. Paget expressed his conviction that, however useful and entertaining lectures might be, the real work of Mechanics' Institutions must be done in the classes.—The Rev. Dr. BOOTH said, the attention which was now universally given to the great question of education, was most encouraging. He could account for the universal interest shown only in this way, that their exists a kind of national instinct, that without science, or a knowledge of God's external laws, we can no more make a satisfactory progress in temporal matters, than we can in spiritual things without a knowledge of his Divine laws. He believed that the opinion was gradually gaining strength, and deepening into a conviction, that in the same way as we cannot afford to leave our fields untilled and import corn, so neither can we much longer bear the cost of leaving the mind of this great nation uncultivated, to bear thorns and brambles. It was nothing to the purpose to say that our fathers got on very well without education. They did so for this reason, that the learning of that day, such as it was, had but little practical bearing on the affairs of daily life. But it was not so now. A common engine-driver on a railway, or an assistant in a chemist's laboratory, possessed an amount of knowledge that would have rendered even Newton still more illustrious. No man argued now against the paramount necessity of well-directed education and skilled instruction, any more than he would against steam navigation, or the railway, or the electric telegraph. But the solution of this great problem had been attempted in various ways. The State, the Church, and the great religious societies had attempted, but with very partial success, to solve the problem, and even if they had completely succeeded they would have left large masses of the population untouched. Now the Society of Arts had attempted to solve this problem in a very different way: and with respect to classes which had not hitherto been reached, to test the results of education, not to inquire into the modes by which it had been given; to stamp the gold when raised from the mine, not to inquire how or where it was raised. This plan of testing the value of the instruction given by means of examination had some peculiar features strongly to recommend it. One of the greatest was its facility of application. It could be brought into operation at once. It took the materials at hand, and set to work at once upon them. The Society of Arts proposed simply to extend to artisans and to the middle classes those advantages which the universities for years had been conferring on the upper and professional classes. The system of testing proficiency by means of examinations was now in full force in the civil service of the East India Company, in the Royal Artillery and Engineers, in several of the government departments, and the extension of this system of examinations was beginning to tell on the progress of education in the country. He would now reply to one or two popular objections against this system. It might be said examinations were not education. Undoubtedly this was true. They were only means to an end. But they supplied men with cogent motives to learn. They pointed out the direction in which the learner ought to proceed. But to a young man entering into business and commercial employment, it might be said by his master, true! this certificate of the Society of Arts bears testimony to your knowledge of Mathematics, or Chemistry, or English literature, or modern languages. But what of that; these things are of no value in my office. I want only very common-place information. But was not the acquisition of these branches of knowledge, in the face of privation, poverty, and hourly occupation, a test of the possession of industry, patience, energy, and perseverance. Were these qualities of no value. Though an employer might not want mathematics in his clerk, he might need the clear head which enabled the clerk to obtain that knowledge. Again it often had been said, the hope of a prize, a reward, or even a certificate was a low motive to hold out to men. You ought to dilate upon the intellectual pleasures of study. You should tell them that learning is its own best reward. But we found that the Almighty, even in this life, had made temporal rewards to wait upon integrity and well-doing, and punishment upon offence. Why had he not left them to carry their own rewards and punishments with them.—A resolution in favour of the Examinations was then proposed by the MAYOR, and seconded by B. CAMPBELL, Esq.—Votes of thanks having been passed to the Chairman and to the Rev. Dr. Booth, the meeting separated.

To Correspondents.

ERRATUM.—In the last number of the *Journal*, page 173, col. 2, line 41, for "James Spiers" read "Richard James Spiers."

MEETINGS FOR THE ENSUING WEEK.

MON. London Inst., 7. Mr. J. N. Hearder, "On Voltaic Electricity."
Chemical, 8. I. Professors Abel and Bloxam, "On the valuation of Nitrogen." II. Mr. R. Adie, "On Thermo-Electric Couples."
TUES. Royal Inst., 3. Prof. Huxley, "On the Sense of Touch."
Civil Engineers, 8. Renewed Discussion, "On the Permanent Way of Railways."
Linnæan, 8. Professor Owen. I. "On a new species of *cuphectella* from the Seychelle Islands." II. "On the characters and subdivisions of the class *Mammalia*."
Pathological, 8.
Statistical, 8. Dr. Guy, "On the duration of Life among Lawyers."
WED. Royal Soc. Lit., 4½.
Society of Arts, 8. Mr. James N. Hearder, "On a new Electric Induction Coil."
THURS. Royal Institution, 3. Prof. Tyndall, "On Sound."
Royal Society Club, 6.
Numismatic, 7.
Antiquaries, 8.
Philological, 8.
Royal, 8½.
FRI. Geological, 1. Anniversary.
Royal Inst., 8½. Mr. C. Dresser, "On the Relation of Science to Ornamental Art."
SAT. Asiatic, 2.
London Institution, 3. Mr. T. A. Malone, "On Experimental Physics, chiefly in Relation to Chemistry."
Royal Institution, 3. Prof. Phillips, "On the Origin and Progress of Life on the Globe—Invertebrata."
Royal Botanic, 3¾.
Medical, 8.

PATENT LAW AMENDMENT ACT.

APPLICATIONS FOR PATENTS AND PROTECTION ALLOWED.

[*From Gazette, February 6th*, 1857.]

Dated 3rd November, 1856.

2580. Eugène Napoléon Cadet, 36, Rue Folie Méricourt, Paris—Improvements in the construction of cocks and taps.

Dated 23rd December, 1856.

3046. Alexander Ross, The Burn, Fettercairn, James Valentine, Woodmyre-cottage, Fettercairn, Alexander Murray, Fettercairn, and Alexander Don, Fettercairn, Kincardineshire—Certain improvements in the purification of coal gas, the residuum of such purifying process being applicable either as a manure or for manufacturing gas from.

Dated 20th January, 1857.

162. William Edward Newton, 66, Chancery-lane—Certain improvements in sewing machines. (A communication.)
164. Frederick Crace Calvert, Manchester—The use or application of certain substances in stiffening, sizeing, or otherwise preparing textile fabrics and paper.
166. Victor Augustin Keintzy, Paris—Improvements in machinery to be worked by steam or other power, for clearing and ploughing land.
168. Richard Quin, 65a, Poland-street—Improvements in stereoscopes.
170. Thomas Boyle, 1, Pilgrim-street, Ludgate-hill—Improvements in outside reflecting lanterns.
172. John Henry Johnson, 47, Lincoln's-inn-fields—Improvements in apparatus for the preservation of money, books, papers, and other property, in case of disaster to ships and other vessels. (A communication.)

Dated 21st January, 1857.

173. Luke Duncan Jackson, Underwood, Nottinghamshire—An improved beer engine or syphon and vent peg, to be used for the purpose of drawing or pumping ales, beer, or other fluids.

174. John Massey and James Hargreaves, junr., Burnley, Lancashire—Certain improvements in machinery or apparatus employed in the preparation of cotton and other fibrous materials for spinning.
175. Henry Chamberlin, junr., Narborough, Norfolk—Improvements in implements or apparatus for ploughing, tilling, or cultivating land.
176. Eloi Jean Baptiste Ledure, Paris—An improved railway-break.
177. William Charles Scott, Waltham-cottages, Camberwell—Improvements in apparatus for separating coin.
178. Robert Ker Aitchison, London—Improved apparatus for the amalgamation of precious metals.
179. Samuel Dyer, Bristol—Certain improvements in ships' fittings, such as mast-hoops, jib hanks, and jib and other travellers.
181. Richard Archibald Brooman, 166, Fleet-street—Improvements in the manufacture of lubricating compositions. (A communication.)
182. Samuel Neville, Gateshead, Durham—Improvements in machinery or apparatus employed in the annealing of glass and the firing of pottery ware.
183. Thomas Harris, Regent's-park—Improvements in apparatuses for refrigerating or cooling, and regulating the temperature in worts and beer, which may also be employed as condensers in distilling.
184. Alfred Vincent Newton, 66, Chancery-lane—Improved means of transmitting messages by audible signals. (A communication.)
185. Henry Cater, Anchor-terrace, Southwark—Improvements in steam boilers.

Dated 22nd January, 1857.

187. Leonard Bower, Birmingham—An improvement or improvements in the manufacture of bolts, rivets, spikes, screw-blanks, nuts for screws, and washers.
188. François Alexandre Nicolas Delsarte and Elisée Valin, Paris—Improvements in pianos and other stringed musical instruments.
189. James Warne, 3, Weymouth-place, New Kent-road—A new combination of metals applicable to decorative and useful purposes, part of which invention is applicable also to the method of combining metals and alloys of metals.
191. Elisha Mander and William Morgan, Birmingham—Improvements in the manufacture of photographic, jewellers' and other cases having wood or papier maché foundations, and where raised regular or irregular forms are required in such cases, and the machinery for carrying out such improvements, parts of which are applicable to other purposes where sawing or shaping is required.
192. Carl Christian Engstrom, Stockholm—Improvements in the construction of projectiles for rifled guns and mortars.
193. John Rubery, Birmingham—Improvements in runners, tap notches, and other parts of umbrellas and parasols.
194. Gustave Perez di Termi, 50, Friday-street—Improvements in the construction of artificial hands.
195. George Haden Hickman and Alfred Hickman, Bilston, Staffordshire—An improvement in the method of manufacturing strip and hoop iron used for making wrought-iron tubes and other purposes.
196. Ernst Luedeke, Raglan-terrace, Robin Hood-street, Nottingham—Improvements in obtaining power when steam, gas, or air is used.
197. Robert Johnstone, 2, Cambridge-place, Agar-town, St. Pancras—Improvements in the manufacture of firewood for lighting fires.
198. William Roberts, Millwall—Improvements in arranging ships' and other similar pumps.
199. Henry William Wimshurst, St. John's-wood—An improved mode of manufacturing sheet metal.
200. James Garth Marshall, Leeds—Improvements in preparing flax, hemp, China grass, and other vegetable fibrous substances.
201. Frederick Sadgrove, 2, Union-court, Old Broad-street—Improvements in the construction of window or other sashes or shutters and frames.

Dated 23rd January, 1857.

202. Abraham Hemingway and Thomas Wheatley, Openshaw, near Manchester—Improvements in slide valves for steam engines and other purposes.
203. George Bedson, Manchester—Improvements in coating iron and other metal with metals or metallic compounds.
204. Charles Frederic Vasserot, 45, Essex-street, Strand—An improved gasogene. (A communication.)
205. Charles Frederic Vasserot, 45, Essex-street, Strand—A hydrostatic bellows. (A communication.)
206. Charles Frederic Vasserot, 45, Essex street, Strand—An improved phosphoric fusee or tinder-box and lighter. (A communication.)
207. George Eskholme and Henry Wilkes, Rotherham—Improvements in ball or other cocks.
208. Peter Armand le Comte de Fontainemoreau, 39, Rue de l'Echiquier, Paris—Certain improvements in fire-arms, and in the bullets to be used therewith. (A communication.)
209. John Folliott Powell, 7, Albion-place, Hyde-park—Improvements in reverberatory and other furnaces.
210. George Fergusson Wilson, Belmont, Vauxhall—An improvement in the manufacture of night-lights.
211. Pier Alberto Balestrini, Brescia—Improvements in electric telegraphs.
212. George Fergusson Wilson, Belmont, Vauxhall—Improvements in the manufacture of candles.

Dated 24th January, 1857.

213. Thomas Ayles and Robert Andrews Ayles, jun., Weymouth—Improvements in the construction of ships and other vessels navigating on water.
215. John Whines, Pimlico—Improvements in machines for dovetailing, grooving, slotting, and rabeting.
217. Joseph Walton, Bradford, Yorkshire—Improvements in looms for weaving.
219. Daniel Green, Vauxhall—Improvements in potters' kilns.
221. Henry Bessemer, Queen-street-place, New Cannon-street—Improvement in the manufacture of iron and steel.

Dated 26th January, 1857.

223. François Constance, Paris—An improved apparatus for casting and finishing types and vignettes used for printing.
225. John Haile, Warren, Rhode Island, U.S.—Improvements in machinery for the manufacture of nails.
227. William Littell Tizard, Plymstock, Devon—Improvements in fermenting, cleansing, and attemperating apparatus to be employed in brewing.
229. Richard Archibald Brooman, 166, Fleet-street—A method of lubricating and preventing the heating of axles, journals and bearings in railway engines and carriages. (A communication.)
231. Francis Hamilton, Acton, Charles Burrell, Thetford, Norfolk, and James Boydell, Gloucester-crescent, Camden-town—Improvements in combining ploughs with locomotive engines.
233. John Henry Johnson, 47, Lincoln's-inn-fields—Improvements in sewing machines. (A communication.)

Dated 27th January, 1857.

235. James Stead Crosland, Openshaw, Manchester—Improvements in locomotive and other steam engines.
237. John Dangerfield, West Bromwich, Staffordshire—Improvements in the manufacture of chains.
239. George Leonard Doelling, 2, Rue Drouot, Paris—Improvements in machinery or apparatus for forming screw threads.

Dated 28th January, 1857.

243. John Elce and John Hewitt, Manchester—Certain improvements in mules and other machines for spinning and doubling.
245. Charles Whowell, Two Brooks, Tottington, Lancashire—Improvements in machinery for stretching, drying, and finishing woven fabrics.
247. George Cranstoun Trotter Cranstoun, Chirnside-bridge, Berwick, N.B., George Young, Dunse, and John Lovell, Chirnside-bridge—Improvements in generating steam.
249. Walter Henderson Sisterson, Southwark—An improvement in cranes.
251. Andrew Peddie How, Mark-lane—An improved anti-garotte cravat.
253. James Lee Norton, Imperial Works, Bromley by Bow—Improvements in steeping or washing and rinsing machines.
255. James Lee Norton, Imperial Works, Bromley by Bow—Improvements in separating animal from vegetable fibres.
257. George Fergusson Wilson, Belmont, Vauxhall—Improvements in treating Burmese and such like petroleum.
259. Henry Chamberlin, junr., Narborough, Norfolk—Improvements in paving or covering the surfaces of roads, streets, or ways.

WEEKLY LIST OF PATENTS SEALED.

February 6th.

1863. Samuel King.
1869. Thomas Austen.
1878. John Darlington.
1883. George Anderson.
1917. John Weir Draper Brown, and George Gibson Brown.
1929. Rd. Archibald Brooman.
1955. Thomas York.
1962. William Edward Newton.
2005. Rd. Archibald Brooman.
2006. Bernard Augustus Grautoff and Charles Henry William Albrecht.
2007. Thomas Watson.
2345. Simon Ghidiglia and Louis Turletti.
2206. John Underwood and Frederic Valentine Burt.
2411. Archibald Turner and Luke Turner.
2467. George Blair.
2821. Archibald Turner.
2951. Rafaello Louis Giandonati.
2957. H. Pease and T. Richardson.
2981. John Stobo.
3027. Daniel West.

February 10th.

1888. Nicholas Doran Maillard.
1894. David Lesser.
1895. Richard Dugdale Kay.
1901. John Knowles and William Clarke.
1924. William Tytherleigh.
1934. Pierre Noyer.
1953. William Akroyd and John Thompson.
2016. James Blake and Francis Maxwell.
2038. Pierre Joseph Guyet.
2094. Thomas Restell.
2345. William Wilkinson.
2358. David Joy and William Holt.
2585. Henry Bessemer.
2726. Henry Bessemer.
2813. Robert Griffiths.
2828. Laban Clarke Stuart.
2877. Laban Clarke Stuart.
2908. James Blain.

PATENTS ON WHICH THE THIRD YEAR'S STAMP DUTY HAS BEEN PAID.

February 2nd.

277. George Mills.

February 3rd.

302. James Taylor, Isaac Brown, and John Brown.

February 5th.

287. Auguste Louis Nicolas Comte Vander Meere.
300. Alphonse François Damiens Duvillier.

February 6th.

320. David Brown and John Brown.
332. William Whiteley.
347. James Cox.
369. George Fergusson Wilson.
377. George Fergusson Wilson.

February 7th.

297. Henry Olding.
326. James Young.

Journal of the Society of Arts.

FRIDAY, FEBRUARY 20, 1857.

EXAMINATIONS.

A deputation from the Council of the Society of Arts, consisting of Colonel Sykes, F.R.S., (chairman), Mr. F. Bennoch, the Rev. Dr. Booth, F.R.S., Mr. C. Wentworth Dilke, V.P., Dr. Stenhouse, F.R.S., Mr. Winkworth, and Mr. Le Neve Foster (secretary), had an interview with the Right Hon. William Cowper at the Privy Council-office, on Monday last, in reference to the examinations established by the Society of Arts.

LOCAL BOARDS OF EXAMINERS.

A Local Board of Examiners, to conduct the preliminary examinations required by the Society of Arts, previous to their general examinations in June, has been appointed at Wakefield for that district. The members of the Board are—

Rev. W. R. Bowditch, M.A., *Chairman.*
Rev. James Bewglass, LL.D.
W. R. Milner, Esq.
Samuel Holdsworth, Esq., M.D.
W. E. Littlewood, Esq., *Secretary.*

ELEVENTH ORDINARY MEETING.

Wednesday, Feb. 18, 1857.

The Eleventh Ordinary Meeting of the One Hundred and Third Session was held on Wednesday, the 18th inst., W. Grove, Esq., Q.C., F.R.S., in the chair.

The following Candidates were balloted for, and duly elected members of the Society:—

Ducie, Earl of.
Escombe, Robert.
Girvan, John.
Howell, Joseph Bennett.
Hunt, Henry.
King, Thomas.
Starling, W. D.
Walton, Frederick.

The following gentleman has been appointed Honorary Local Secretary:—

Herbert M. Holmes, Esq., for Derby.

The Paper read was:—

ON A POWERFUL MODIFICATION OF THE INDUCTION COIL AND SOME NEW ELECTRICAL PHENOMENA DEVELOPED BY IT.

By Jonathan N. Hearder, Plymouth.

The medical or galvanic coil machine is an instrument so well-known, that it would seem to require very little description. Almost every tyro in electricity has sought to attain to the construction of one of these instruments in one form or another, and the satisfaction derived from a successful effort has been often felt equivalent to taking a degree in electrical science. The forms which have been given to the electro-magnetic coil machine have been of a very diversified character, some have been content to copy from the labours of their predecessors, whilst others have, either from preference or necessity, acted upon their own acquaintance with the laws and phenomena of electro-magnetism, and thus, the qualities and characteristics of these instruments have been as varied as their forms. The principal object with all appears to have been the production of a shock of various degrees of force, and very little more than this has ever been aspired to, though it is difficult to understand how a phenomenon, capable of so extraordinary an amount of extension, and occasionally giving such striking evidences of the existence of this susceptibility, should have remained so long undeveloped, the instrument itself assuming very little more than the character of a scientific toy. On several occasions, when the conditions have been such as to favour a more than ordinary development of the power of the induced current, unusual effects, such as tension sparks as much as ⅛ of an inch in length, have been produced, but until within the last two or three years, no attempt has been made to increase these effects by any modifications of the arrangements necessary to produce them.

Having being myself many years engaged in the manufacture of an improved form of the medical coil machine, for which, in 1846, I received the silver medal from the Royal Cornwall Polytechnic Institution, I had often been struck with the exalted statical condition of the secondary terminals, especially in some of my largest machines, although no attempts at insulation beyond the ordinary cotton covering of the wire were made, and I often promised myself to try the effect of a more perfect insulation. From want of leisure and other circumstances, I was not induced to carry out the experiment until I heard of the effects produced by a machine manufactured by M. Ruhmkorff, of Paris, and finding on inquiry that it was nothing more than a powerful induction coil, the precise arrangement of which, however, from its peculiar mode of construction, could not be well ascertained, I immediately proceeded in the absence of any definite information about it, to act upon my original suggestions, and construct an instrument upon my own plan. In this I have not only had the satisfaction to succeed beyond my expectations, but also to find that the arrangement which I have adopted appears to admit of a very considerable amount of extension.

In order clearly to understand the circumstances which give rise to this extraordinary increase of power in the induction coil, as it is now called for the sake of distinction, it will be necessary to make a brief analysis of the principles involved in the construction of electro-magnetic coil machines in general. They are based upon two facts first discovered by our illustrious Faraday, viz., 1st. When a current of voltaic electricity passes through a metal helix, an inverse current of transient duration takes place in the same wire, in a direction opposite to that of the battery current, at the instant when the battery current begins to circulate; and when the battery current is suspended, another wave or current of a similarly transient character takes place in a direction opposite to the first one. 2nd. If the first metal helix be surrounded by a second helix which shall be insulated from and totally independent of it; these secondary waves or currents will be found to take place in the second helix as well as in the first, although none of the battery current passes through it. These effects are greatly enhanced when the helices are made to include an iron bar, or, still better, a bundle of iron wire. These experiments are the foundation upon which all electro magnetic induction coils are constructed, and their various qualities depend on the judicious adjustment of the two helices and the battery to each other. As the development of these phenomena depends upon certain definite laws, it will be necessary to describe these a little more in detail:—For this purpose, induction coils may be considered to consist essentially of three parts, whose functions must be separately examined, viz., first, the primary coil, whose office is to conduct a current of dynamic electricity from a voltaic battery. 2nd. A soft iron core intended to take up, concentrate, and radiate the magnetic influences of the battery current. 3rd. The secondary coil, whose function is to develope the electrical effects due to the re-action of any uncontrolled magnetic intensity excited in the iron core.

In the new form of induction coil, another element, and a most essential one, invented by Fizeau, has been introduced, called the condenser, but as it is independent of the others, and has not hitherto entered into the construction of the ordinary coil apparatus, it will be considered in another place. It is scarcely possible to contemplate the action of any one of these elements apart from the rest; they are so intimately connected with each other, that trifling variations in the character or arrangement of any of them will influence very materially the action of the rest. In considering the iron core as a separate element, I am aware, that although its presence is found to exalt the effects of the induced current, it is not generally considered that it originates any portion of that current, but I have long entertained an opinion, that, in all cases in which secondary or statical currents are developed by the action of primary ones, they do not depend upon any peculiarities of the primary currents themselves, but upon the magnetism developed by them, and that they are, indeed, dependent upon magnetic action solely, no matter how produced. I have kept this principle in view, not only in the construction of my medical coils, but in my new induction coil, and find the correctness of the principle constantly established.

In the construction of the ordinary galvanic coil machine, very little attention appears to have been paid to the relation existing between the primary wire and the battery current, so as to judiciously apportion the resistance of the former to the electro motive character of the latter, hence, machines having the same quantity of secondary wire give very different effects with the same battery, in consequence of the diversified arrangement of their primary coils. It must be remembered, that the quantity, as well as the intensity of voltaic pairs, will vary as much as from one to four, and as the effect of resistance in diminishing the power of a battery current is very considerable, too great attention cannot be paid to the judicious arrangement of this element.

The effect of the passage of the voltaic current through the primary coil is to develope magnetism; whether within the coil or externally to it is a matter of question, though I believe the latter to be the case. If an iron wire be included within this primary coil the magnetism thus developed is taken up by it, and distributed throughout its whole mass, and by this means the core becomes a homogeneous magnet, representing the sum of all the forces of the surrounding coils, which are equivalent to so many little isolated magnets acting under disadvantageous circumstances. This magnetic condition of the iron core being due to the action of the voltaic current traversing the wire, will be modified, not only by the varied character of the current itself, but by any variations in the length and resistance of the wire, and will only last as long as the exciting cause is kept up. This development of magnetism is, however, not the only phenomenon which takes place here, for it was found by Faraday, that as a voltaic current originates magnetic action, so magnetic action itself is capable of giving rise to an electric current, and this latter, being the result of reaction, takes place, as might be supposed, in the opposite direction; so that, in point of fact, when a voltaic current is traversing a wire in one direction and producing magnetism, the wire is also traversed by a second current, due to the reaction of the magnetism, in an opposite direction. It is not very easy to understand how a wire can thus carry two currents at once in opposite directions, unless the currents may be supposed to partake of different natures, which is not at all improbable. This secondary or induced current is, however, extremely transient, existing only during the time occupied in the change of the iron from the normal to the magnetic state; for, after the first impulse, the wire, so far as regards the second current, is neutral. When the battery current is suspended, the sudden change in the core from the magnetic to the normal state originates a new induced current in the wire in a direction opposite to the first. Now, as the first induced current was in opposition to the battery current, so the second, being the converse of the first, is in the same direction as the battery current; but in this latter case the wire is carrying one current only, viz., that induced by the magnetism. There is a considerable difference in the character of these two induced currents. The former, being the result of a change from a state of rest to a state of activity, is comparatively gradual in its development; but the latter, resulting from the sudden destruction of the magnetic intensity, is instantaneous, and characterised by a greater intensity of action, increasing in proportion to the length of the coil, and the exalted magnetic state of the core. The intensity of the induced current derived from the interruption of the current is so great that it overleaps the interval at the points of separation, in the form of a statical spark, thereby completing the circuit. The length of this static spark is greater in proportion to the length of the secondary wire, but with a single wire there are no means of ascertaining what length of spark might really be obtained, as the whole of the current generated in the wire passes at the instant of the solution of contact; its physiological and galvanometric effects, however, afford some evidence of its high intensity, and some galvanic-coil machines are constructed with a single wire only, under the erroneous impression that, because only a primary coil is used, the shock which is produced is also the effect of a primary current, or the direct current of the battery; whereas the shock is the result of a secondary or induced current as much as if it circulated in a secondary wire, since it occurs, not when the battery current is passing, but when it ceases to pass.

If a second wire be made to surround either the first helix, or any portion of the iron core, so as to be brought under the influence of its magnetism, induced currents will be excited in it coincident with those of the primary coil, although it shall be perfectly insulated from it. The statical intensity of these currents will be greater in proportion to the length of the wire and the exalted magnetic condition of the core, and if the wire be covered with cotton, and be of considerable length, static sparks may be obtained at the terminals, even though they may be in contact with the wooden portions of the instrument. I had often noticed these effects with my own medical-coil machines as early as the year 1842, especially with the more powerful ones, from which bright and vivid sparks were elicited between coke terminals, and Leyden jars could be charged so as to give an appreciable spark and affect the gold-leaf electrometer. Judging from such effects as these, in the absence of any approximation to good insulation, that much longer sparks might be obtained if the secondary wire were perfectly insulated, I had often promised myself to try the experiment, but neglected to do so until stimulated by the improvements of M. Ruhmkorff.

Various attempts have been made from time to time to increase the statical power of the secondary wire by increasing its length, but, for want of sufficient attention to its insulation, no effects have been hitherto obtained at all commensurate with the extra quantity of wire employed. Some years since Mr. Henley constructed a powerful arrangement of primary and secondary coils, which gave static sparks in free air of 1-eighth of an inch in length, with a battery of moderate power. With a more perfect insulation, however, and with the employment of the now essential element, Fizeau's condenser, doubtless Mr. Henley's effects would have been very considerably increased. Whatever effects have been produced with the ordinary modes of insulation, they have all fallen very far short of those produced by M. Ruhmkorff, who has the merit of having been the first to give to the machine an entirely new character, and to endow it with properties which it never before possessed. This he has accomplished by great attention to the insulation of his coils, but what the precise means are which Ruhmkorff has employed, or what are the exact dimensions of his primary and secondary coil, there are no easy means of ascertaining, since the whole is embedded apparently in melted shellac, by which it is so thoroughly compacted together as to prevent the possibility of unwinding it without the risk of spoiling the instrument. Report says that Ruhmkorff's instruments usually contain from 4 to 5 miles of secondary wire, though some have been made of more than twice this size, and the different coils are, through the intervention of the shellac, so far insulated from each other as to enable the induced current to obtain a degree of tension sufficient to overleap an interval of ½ an inch or more. This increase of power is, however not entirely owing to the more efficient insulation, for without the addition of the new element, viz, the condenser, the sparks are not one-eighth of an inch in length. Ruhmkorff appears to have satisfied himself that he had obtained pretty nearly the maximum of effect from the quantity of materials which he has employed, since, although it would appear that he has constructed some scores of the instruments, I believe they do not usually give sparks exceeding 5 or 6 tenths of an inch in length. The Induction Coil, however, as presented to the scientific world by Ruhmkorff, has served to develop an entirely new class of phenomena, and to open a field for investigation of a novel and interesting character. Before proceeding to describe any further improvements of the apparatus, it is necessary to say a few words on the nature and action of the condenser, which appears to be the most important agent of the whole. This consists of an extensive surface of oiled silk, or other thin non-conducting tissue, coated on each side with tin foil after the manner of a Leyden jar, leaving round the tin foil an uncoated margin. This, for economy of space, may be folded into any convenient form, provided the opposite coatings be kept from touching each other. When used, a wire or conducting strip of metal from each coating, is connected with the portions of the primary coil where the interruption is made, so that when the current is broken the interrupted ends are respectively in metallic communication with the opposite coatings of the condenser. What the rationale of its action may be is at present rather doubtful, but, in the absence of a more satisfactory solution of the problem, it may be supposed that at the moment of breaking the contact, the induced current exhibits its intensity at the points of separation by overleaping the interval, but if these two interrupted ends be in contact with the extended conductors of the condenser, a portion of this intensity may possibly be reduced by its being determined in the direction of the two conductors, which, by inducing upon each other, have their capacities for electrical change considerably increased, and thereby act as capacious reservoirs, in which these intensities may, as it were, expand and exhaust themselves. Be this true or not, the strongest machine without a condenser dwindles into insignificance. Its reaction upon the secondary coil, however, demands a little more notice. Without the condenser the secondary current due to the inductive action of the magnetic change in the iron core, from the active to the passive state, would be divided between the coils surrounding the core, a portion of it circulating in each, but the greater portion, perhaps, would circulate in the one which afforded the least resistance, and as this would be the primary coil, it would follow that the intensity of the secondary one would be diminished just in proportion to the quantity circulating in the primary one. The condenser seems partly to intercept the circulation of the induced current in the primary coil, and thereby concentrate its action more particularly upon the secondary one, the statical condition of which is thus greatly exalted. The form which Ruhmkorff has given to his instrument is at once compact, light, and elegant; the coil itself is about 12 inches long and about 4 inches thick, having plate glass ends, through the centres of which project the ends of the iron core. One end of this core attracts a little iron hammer which rests on an anvil, the touching surfaces of which are armed with platina. The anvil and hammer, being made part of a circuit, constitute together an interruptor, contact being broken whenever the hammer is attracted up from the surface of the anvil. In addition to this the instrument is furnished with a commutator, for the purpose of reversing at will the direction of the current. The ends of the secondary coil pass out through holes in one of the glass plates and are connected with binding screws, fastened on the tops of two little glass pillars serving as insulated terminals, with which may be connected any apparatus for the purpose of experiment. The following are a few of the phenomena developed by the instrument. When two small wires connected with the terminals, have their free ends brought near to each other, streams of sparks pass between them at a distance varying from 0·4 to 0·6 of an inch, when 10 or 12 cells of a nitric acid battery are connected with the primary coil of the instrument. These sparks inflame combustible substances such as gunpowder, alcohol, guncotton, writing paper, cork, &c. When connected with two insulated wires projecting into the interior of a globular or egg-shaped receiver of 5 or 6 inches diameter, a brilliant atmosphere of light is produced on exhausting the air, and when the intensity is carried beyond a certain point crimson and violet sparks pass between the terminals some three or four inches in length. A Leyden jar having its two coatings respectively in connection with the two terminals, and having a second discharging wire also leading from its outer coating to within a short distance of the wire connected with the inner coating, becomes charged so as to discharge itself spontaneously over this small interval at every interruption of the primary circuit. Many other effects might be noticed, but they will be alluded to more at length in connection with a more powerful instrument which I have now to describe, and which is one of my own construction. My first step in the construction of this new instrument was to make all the parts separate, and independent of each other, so that I could by this means ascertain what influence modifications in any one of them would exert upon the rest, and I was soon able to put these various parts together, so as to form one entire machine. My coil was six inches in length, and contained about 1½ miles of fine secondary wire; it was wound upon a hollow bobbin of wood, covered with gutta percha, and having its centre large enough to contain the primary coil with its iron core, of which I constructed several modifications, to suit batteries of different electro motive force. The secondary wire was covered with silk, and the layers insulated from each other with oiled silk and gutta percha. I also made a variety of condensers, and found the following substances well adapted for them, viz., common cartridge paper, varnished paper, oiled silk, gutta percha, and thin vulcanised india-rubber. I likewise varied the form of the condensers so as to bring both surfaces of each sheet of tin foil to act, thereby doubling the inducing surface, and this I effected by placing sheets of tin foil between sheets of the insulating tissue and connecting the alternate sheets at opposite ends; or by employing an extra insulating layer upon one of the sheets of tin foil, and folding the whole over and over: or again by rolling the same arrangement upon a round roller of wood, &c. With this machine I was able to obtain sparks between the terminals more than one inch in length and to charge a Leyden jar containing three square feet of surface, so as to give a torrent of brilliant discharges between platina terminals. With this instrument I discovered some curious phenomena connected with the alterations in the character of the induced current, under the influence of the Leyden jar, and first shewed its thermal effects upon a wire forming part of the circuit. In September last I exhibited this machine at the Royal Cornwall Polytechnic Society, and was there honoured with the Society's first silver medal. Although it contained only one-third of the quantity of secondary wire said to be used in Ruhmkorff's machines, the effects produced from it were very much more powerful. Whether this arose from a more perfect insulation, or from anything different in the arrangement of the coils, I am hardly prepared to say, knowing so little of Ruhmkorff's plan; but I have discovered by experience that the better the insulation, the more powerful the machine.

Since this first instrument I have constructed others of various degrees of power, and the effects produced by some of them have not only greatly surpassed all that have been previously observed, but I have also been able to develop some entirely new phenomena through their agency. The principle upon which these machines are constructed is still the same, but the difficulties in the way of preserving a perfect insulation under very high powers are such as I had not at all anticipated. The mode, however, which I have adopted in the construction of my instruments I have found most advantageous, since it affords the means of examining from time to time the phenomena which have taken place in the interior of the coil during its long-continued action, or when subjected to peculiar conditions. Although a very perfect insulation develops a high state of tension in the secondary current, yet even this may be forced too far, just as we may overcharge a Leyden jar, and fracture the glass, for if we attempt to force the instrument beyond a certain point, some portions of the insulation break down, and the electricity, having once made a way for itself, will always pass subsequently with greater facility, thereby lessening the maximum power of the current. In Ruhmkorff's instruments accidents of this kind are irreparable, from the solid character of the insulating medium; and their arrangement, moreover, prevents the development of any high power, since the insulating interval of glass between the body of the coil and the copper band which secures it to the base of the instrument is very small. In my own instruments the secondary coil is so arranged that it can be unwound, and all the insulating layers taken out to examine their condition, or repair accident, &c. My primary coils, also, are detached, which is another important desideratum, as they can be changed for the purpose of experimenting with batteries of different electro-motive characters. They are, also, furnished with extra binding screws, for connecting any number of them consecutively or collaterally. The condenser is also capable of being thrown out of connection. Having described the rationale of the action of the induction coil, together with the mode of construction, it now remains to illustrate its action by a few experiments.

Experiment 1. When the terminals of the secondary or induced wire are connected respectively with the wires of a universal discharger, the ends of which are furnished with pointed platina wires to serve as electrodes, bright thick crepitating sparks pass between the platina points when they are brought within a certain distance of each other, and with a powerful machine and a battery in good action the points may be separated nearly four inches, when the sparks assume a zigzag character, the deflections being so great as to make the real length of the spark sometimes as much as one-fourth or one-third more than the interval itself.

Experiment 2. If, whilst sparks are passing between the points, the condenser be disconnected, the sparks disappear, but re-appear on connecting it again. An instrument which will give a two-inch spark with a condenser will not give one of an eighth of an inch without it.

Experiment 3. If when sparks are passing at the distance of half an inch the points be gradually approximated, one of them, viz., that forming the negative electrode, will become red, and even white hot, and if the machine be powerful both become ignited on a nearer approximation to each other; this, however, is not the case with Ruhmkorff's machine. If very fine iron wires be substituted for the platina electrodes, the negative wire will burn away, rapidly fusing into globules, and throwing out brilliant scintillations.

Experiment 4. If the points be placed beyond the striking distance, sparks and brushes of light will be seen passing from the positive electrode, over a portion of the interval, and the negative electrode will be illuminated by its characteristic star of light, also throwing off smaller brushes, which re-curve over the wire, and either terminal will give sparks to an uninsulated conductor brought near to it, which will be longer if the opposite terminal be connected with the ground; this, however, is not the case with Ruhmkorff's apparatus, only one terminal of which, viz., that which proceeds from the outer portion of the coil, is capable of giving sparks by itself; if an imperfect conductor, such as a piece of paper or wood, be introduced lengthwise between the points, the sparks will then pass from one to another over its surface.

Experiment 5. If the flame of a spirit lamp be placed between the points of a discharger, the sparks will pass several inches through it, and with one of my powerful machines, sparks of a foot or more in length may be obtained in this way through the flames of several spirit lamps placed side by side.

Experiment 6. When sparks are passing between the terminals at a distance of about half an inch, combustible substances, such as paper, cotton, shavings, gunpowder, gun-cotton, inflammable liquids, &c., may be kindled by being introduced between the points.

Experiment 7. If we place the points of the universal discharger three or four inches apart, on the surface of a piece of soft wood or cork, which has been previously moistened with a little sulphuric or nitric acid, the substance is ignited and kindled into flame about the points of the discharger; sparks at the same time pass along the surface of the wood or cork from point to point, and the flames and combustion quickly extend in a direction towards each other, until, in the course of a minute or two, they meet, and produce an ignited line of connection between the points.

Experiment 8. If metallic filings be fastened, by varnish, upon the surface of a plate of glass, sparks ten or twelve inches in length may be passed over them, the colour of which will vary according to the metal used.

Experiment 9. If the two wires leading from the terminals of the coil to the universal discharger be connected respectively, one with the outer, and the other with the inner coating of the insulated Leyden jar, the sparks between the points of the discharger will be much shorter, but they will be very much louder and brighter, assuming quite the character of the Leyden discharge.

Experiment 10. If a portion of gunpowder be now placed upon the table of the universal discharger, it will not be inflamed by the spark of the jar, but will be dispersed, as in ordinary frictional electricity; though I have discovered that if one of the wires be detached from the universal discharger, and a piece of wet string be made the medium of communication, the gunpowder will then be inflamed. In this experiment care must be taken that the wet string be inserted in the portion of the circuit between the discharger and the jar, and not between the jar and the coil.

Experiment 11. The length of the spark and its strength when the Leyden jar is used, will depend upon the size of the jar. The smaller the jar the longer the spark, but larger jars give shorter and louder sparks. With a large jar, containing more than three square feet of surface, a roar of discharges may often be procured 0.4 of an inch in length.

Experiment 12. If these discharges be made to pass through an iron chain of ten or twelve feet in length, suspended in a festoon, sparks accompanied with brilliant scintillations will occur at every link.

Experiment 13. If the discharges of the jar be made to pass through a large lump of loaf sugar, a crystal of alum, muriate of ammonia, bichromate of potash, prussiate of potash, sulphate of copper, &c., these crystals will be splendidly illuminated.

Experiment 14. If a Leyden jar, coated with detached diamond-shape spots of tin-foil, be insulated and connected with the terminals of the coil, it will be brilliantly illuminated during the whole time that the machine is in action—much more so than with a common electrical machine.

Experiment 15. If a plate of glass be coated on one side with tin-foil, leaving an uncoated margin of glass, and on the other side be only partially coated, the tin-foil being laid on in the form of a star or other device, this will be surrounded with a beautiful light fringe of electric light when connected with the machine, and, at the same time, a most powerful odour of ozone will be given off.

Experiment 16. Coat a large glass flower vase, from eight to ten inches high, internally with tin-foil to within an inch or two of the top, and place it on an air-pump. Cover it with a receiver having a sliding wire passing air-tight through the top of it; let the wire be depressed so as to touch the tin-foil coating of the glass. Connect the outer end of the wire with one terminal of the coil, and the pump-plate with the other terminal. When the machine is in action a splendid cascade of electric light will be seen flowing over the edge of the glass, and apparently falling on the pump-plate, when the upper wire is made positive, but when the current is reversed the electrical appearances undergo a marked change, and the current appears to flow upwards instead of downwards.

Experiment 17. If a tall receiver, from two to three feet in height, having a cap and sliding wire on the top, be placed on the air-pump, and the air exhausted, a splendid aurora borealis fills the tube with coruscations, and if the machine be sufficiently powerful a spark in the form of a crimson ribbon may be obtained, from two to three feet in length. The spark of this kind with Ruhmkorff's apparatus, however, rarely exceeds a few inches.

Experiment 18. If this experiment be modified by partially filling the receiver with hydrogen gas and exhausting again, the electrical appearances are very beautiful, the light in the interior appearing intersected by dark bands, which arrange themselves in a symmetrical form.

Previously to some of my recent investigations the induced current was considered to be incapable of heating a metallic wire, unless passing between its extremity and another conductor; but I have lately shown that when the current is modified by the action of the Leyden jar, it develops thermal effects in metallic wires of a novel and interesting character, as will be seen by the following original experiments.

Experiment 19. Place in the circuit between the two terminals of the induction coil, Harris's thermo-electrometer, either in its orginal form or in the form in which I have modified it, for voltaic purposes. Connect also in the circuit Lane's discharging electrometer, for the purpose of modifying the length of the spark. Pass a current thus through the electrometer and no effect will be observed.

Experiment 20. Now insulate a Leyden jar and connect its outer coating by means of a wire, with one of the terminals of the coil and its inner coating with the other terminal, all the other connections of the former experiment remaining as they were. On adjusting the points of the discharger, so that the sparks may pass, the wire will now be found to be heated, the amount of heat produced being pretty nearly in the simple proportion of the coated surface of the jar. This law appears to be quite new.

Experiment 21. The apparatus being arranged as in the previous experiment, place a little gunpowder between the points of the discharger and it will not be inflamed, but simply dispersed, though the wire in the electrometer will be heated. Now insert a wet string between the discharger and the electrometer, and on passing the discharges the gunpowder will be inflamed, but the electrometer will not be heated.

Experiment 22. If instead of the thermo-electrometer a piece of fine iron wire, about two or three inches long, be placed in the circuit, it will be instantly fused when the discharges pass.

The induced current thus appears to be considerably modified in its character by the intervention of the Leyden jar, and the nature of this change may be beautifully shown by the following arrangement:—

Experiment 23. Connect a thermo-electrometer and a Lane's discharging electrometer with the terminals of the coil. Upon an adjoining table, place a disc of wood covered with tin foil, exposing a flat surface of five or six square feet and connect it also with one terminal of the coil. Take a second similar disc of wood coated with tin foil and suspend it over the first one, by means of a string, passing over pulleys in a frame so constructed as to admit of the second discs being raised to the height of five or six feet above the lower one. Connect this disc by means of a flexible wire with the other terminal. By this arrangement the two terminals have virtually their conducting surfaces increased, and the sparks consequently are much brighter, though the thermo-electrometer is unaffected. If now the upper coated disc be gradually lowered, the sparks rapidly increase in power, and when they are within three or four inches of each other, the sparks assume the character of the discharges of a Leyden jar, and the thermometer begins to be affected. As the discs are gradually lowered still further their faces being kept parallel to each other, the sparks become still louder and the thermometer rises 15 to 20 degrees, the discs thus acting as coatings to a charged plate of air. On removing the upper plate these effects subside, and the spark re-assumes its original character. The difference in the thermal properties of the induced current, with or without the intervention of the Leyden jar, is shown by the following experiment:—

Experiment 24. Insulate a Leyden jar, and apply to it a Lane's discharger; connect between the discharger and the outside of the jar a thermo-electrometer, so that the discharge of the jar may pass through it. Insert two other thermo-electrometers respectively in the portions of the circuit which are to conduct the electricity from the terminals of the coil to the inner and outer coatings of the jar, so that the course of the electricity may be assumed to be as follows, viz.—from one terminal of the coil through one thermo-electrometer to the inside of the jar, thence through the discharger and thermo-electrometer connected with it to the outside of the jar, and lastly, from the outside of the jar through the remaining thermo-electrometer to the other terminal of the coil. Now set the machine in action, and the electrometer which connects the two coatings of the jar will show a rise of temperature, whilst the two electrometers which serve to conduct the current between the coil and jar are not in the slightest degree affected. Since the Leyden jar, under the influence of the coil, is capable of producing the same class of effects as when charged by the common electrical machine, we have thus a link of connection opened which may one day serve to establish some relation between equivalents of frictional and voltaic electricity. At present I have only attempted to compare the effects of the coil with the electrical machine by estimating the amount of glass surface necessary to be rubbed to produce effects equal to the induction coil. In order to do this, I have been obliged to contrive an apparatus, which I have the honour to exhibit to the Society, which will register the number of discharges of the jar per second, the value of such unit being determined by other means. In one of Prof. Grove's papers in the *Philosophical Magazine*, he proposed to count the discharges by causing a piece of paper to pass with a given velocity per second between the discharging points, and the number of perforations thus made per second might be registered. As it was a matter of some difficulty with me to construct an apparatus in which a uniform and definite velocity in a paper disc should be maintained, I had recourse to another expedient, which I find to be most simple and efficacious. The instrument is thus constructed:—two circular discs of wood, about five inches diameter, are screwed together upon one common axis, so as to embrace a circular disc of paper, about 12 inches diameter, between them. One of the discs of wood is made moveable, for the purpose of changing the discs of paper when required. This is mounted with a handle, so as to rotate vertically like the plate of an electrical machine. Upon the same stand are placed two vertical brass pillars, having steel bearings on the top, which serve to support the knife edges of the axis of a half seconds pendulum, so situated on the stand as to hang about two inches from the edge of the paper disc, and make its oscillations in the same plane. Through a wooden head piece, fastened on the axis of the pendulum, pass two copper wires, enclosed in gutta percha. These wires are about two inches apart, and they stand out horizontally about eight inches in length, like two arms stretching towards the paper disc, one on each side of the top of its periphery. Here the points are turned towards each other, and brought within one-eighth of an inch of the paper on each side, so that the naked ends of the wires are about a quarter of an inch apart, having the paper disc between them, and are so adjusted as to stand about half way between the edge of the paper and the wooden plates which hold it. The other two ends of the wires pass about one inch through the head piece, and are there bent into two hooks, the gutta-percha coating being removed from them. Upon these hooks hang the ends of two light and flexible wire-cord conductors, connected respectively with the inner and outer coatings of the jar, which latter is also in connection with the coil.

Experiment 25. The apparatus being thus arranged, if the pendulum be made to swing, the two arms will describe an arc over the periphery of the paper and if the coil be set in action, discharges will pass between the points, marking the arc with perforations. If now the disc be turned on its axis, a series of curves will be described by the perforations from the oscillating points. The number of perforations in each curve may be counted, and if reckoned from the top of one curve to the top of another, we get the number per second, or if from the top of one curve to the bottom of the same one, the number in a half second. The rapidity of the discharges will depend upon the nature of the interrupting spring employed in the coil, and as many as 100 to 200 per second may be obtained.

In order to ascertain the value of each unit of discharge, the following experiments must be made without the before-mentioned apparatus.

Experiment 26. Connect the jar used in the preceding experiment with the coil, and place in its circuit a thermo-electrometer as described in Experiment 20, but instead of allowing the spring to vibrate by itself, break contact with it at separate intervals with the hand, so as to get single discharges from the jar; note how high the fluid rises in the electrometer with each discharge. Next apply the same jar to the conductor of an electrical machine, the thermo-electrometer being connected with it in the same way, and then ascertain how many turns of the electrical machine are required to produce a charge in the jar capable of raising the fluid in the electrometer to the same height; the surface rubbed may then be easily calculated by multiplying the circumference of the cylinder by the width of the rubber and number of turns, which will give the equivalent in glass surface for a single unit of discharge from the coil. And this multiplied by the number of discharges per second obtained from the coil, will give the number of square feet necessary to be rubbed per second to produce an equal effect. In estimating the surface of a plate machine, the surface rubbed at a single revolution must also be multiplied by the number of rubbers.

I trust that the few experiments and illustrations which I have now had the honour of laying before the Society, are sufficient to show the character of the new instrument, but as to the extent of its capabilities, or the degree of extension of which its principles may be susceptible, time and experiment alone must decide the point. I cannot conclude, however, without alluding to some practical purposes to which the machine appears eminently adapted. The first and most important is its use as an electro-motive agent for the electric telegraph. The secondary current produced by it is precisely similar to that developed by the magneto-electric apparatus, in which magnetism alone is the exciting agent, but with this difference, viz., that its intensity, or power of overcoming resistance is infinitely greater, and I should consider a modification of it as the most efficient mode of exciting a current for a long circuit, such for instance, as the one between England and America, that can possibly be employed. The apparatus may be made compact and powerful, and the expense of working not worth consideration, since it might even be arranged so as to work with a battery, that might be carried in the waistcoat pocket.

The next important use to which it may be applied is for firing charges of gunpowder at a distance; the peculiar fire-like character of the spark occurring between interruptions in the circuit seem to adapt it especially for this purpose, and the great intensity of the current gives it a power of producing these results through a length of wire, which would require an enormous amount of voltaic battery power to traverse it, so as to produce the same effect. Extensive experiments of this kind have already been performed in France with great success.

A third application of it would be for the purpose of electro-metallurgy, but the secondary coil of the instrument would require some considerable modification to adapt it efficiently to this purpose.

I trust that I have now said enough to commend the instrument and the phenomena which it produces to the attention of the scientific world, and I feel quite satisfied that the principles will one day be developed to an extent, of which at present we have no conception.

DISCUSSION.

Mr. Edward Highton, C.E. said, that as the effects produced by voltaic electricity depended on so many circumstances, he hoped the author of the paper would add an appendix, stating the diameter and length of the iron core, the diameter and length of the primary and secondary coils, the kind of battery employed, the number of cells, the area of the plates, their distance apart, and the exciting liquid used, all of which formed elements in the production of power and effect from voltaic electricity. He then expressed a hope that as Ruhmkorff's coil had been so often referred to, there might be some one present to give an account of its details and peculiarities. He then adverted to the great advantage of winding coils in a manner similar to that employed for winding bobbins of cotton, and stated, that by such a method, nearly one-third more wire could be placed in the same cubical space. He remarked, that it was well worthy of experiment, to ascertain whether the placing of less wire in either or both coils, round the middle or dead part of the iron core, and more wire round the poles would be attended by increase of power in the induction coil. With respect to the use of muriate of ammonia for galvanic batteries, as mentioned by the author, he stated that many years ago he himself had used the same substance with great success, for batteries for telegraphic purposes, on the London and North-western Railway. He spoke in great praise of the instrument exhibited for recording the number of currents passing per second. With regard to the proposed employment of the induction coil for telegraphic purposes, he thought it probable that in very long lengths of wire, and where the resistance of the circuit was great, it might be used with advantage. It possessed many peculiar advantages, inasmuch as it enabled a person to vary both the quantity and intensity of electricity; and as long lengths of wire naturally required electricity of greater intensity to produce a certain effect at the far end, care must be taken not to employ electricity of so great an intensity as to break through the insulating matter surrounding the wire. He referred to an instance in Brussels, where the gutta-percha covering to a telegraphic wire was burst open by using electricity of too great an intensity. He then enumerated several instances of great length over which telegraphic messages had been sent from London. Communication had been held between London and Lemberg, a distance of 1700 miles, instantaneously by means of relays, and also between London and Memel, which were about the same distance apart. Only a few hours ago London was talking *direct* with Marseilles, instantaneously without any relay, the distance, by wire, being about 850 miles. In all these cases the galvanic battery was employed. Still he had no doubt that when a suitable modification of the induction coil comes into use, telegraphic messages would be transmitted over far greater distances than at present. He considered that the proposed telegraph to America offered a grand field for experiment with the induction coil, and he concluded by saying that the experiments exhibited that evening were most instructive, and several of them were new to him and he believed to the Society at large, and that a further prosecution of similar experiments could not but tend to advance man's insight into the mysterious laws of electricity, and enable him to apply that power more extensively to the wants, comforts, and pleasures of his fellow-men.

Mr. GASSIOT, F.R.S., in reply to a question put to him with regard to the construction of Ruhmkorff's coil, stated, that to the chairman the honour was due of having first introduced that instrument into this country. A small coil was procured at an early period, and subsequently he (Mr. Gassiott) obtained one of larger dimensions. Ruhmkorff had been early impressed with the necessity of perfect insulation of the wire, but, perhaps from the philosophical instrument makers of Paris did not receive that encouragement which he deserved—his great object being to make the instrument at as reasonable a price as possible. Hence the cheap mode of insulation by covering the wires with a coating of cotton had been adopted by him, although it would seem to be but an imperfect method. The construction of the coil itself was very beautiful in every particular, but not so perfect as had since been worked out by Mr. Hearder and Mr. Bentley. Having met with an accident to the Ruhmkorff's coil in his possession, by which the connection of the secondary wire was broken, he had the opportunity, as it were, to dissect the instrument in order to ascertain its mode of construction. The core consisted of a bundle of wires covered with cotton connected at each end, although he doubted whether the insulation ought not to be complete. The primary wire consisted of three or four layers of moderately thick copper wire. There were two or three folds of gummed paper round the primary coil, before commencing the winding of the secondary wire, and upon this the wire was wound, and between every two or four layers of the wires thick gummed paper was placed. He did not apprehend that this was at all connected with the insulation, but rather for the purpose of allowing the wire to be laid on evenly. What they had in the Ruhmkorff coil was a carefully covered cotton wire evenly wound, which formed the secondary coil. In the instrument of Mr. Hearder, where greater pains were taken to secure perfect insulation the effects were more powerful. The mode of insulation adopted by Mr. Bentley was by coatings of gutta percha, by which means perfect insulation was obtained. To what extent the powers of those instruments might be carried it was impossible at present to say; the only limit to this might be said to be the danger of the disruption of the insulating medium, by the force of the electric current transmitted through the wires.

Mr. CHARLES BROOKE, F.R.S., offered some general remarks upon the phenomena exhibited by Mr. Hearder in his experiments, particularly with regard to the heating power of the electric current at different points of the circuit. He considered that the fact of heat being developed in the electrometer when interposed between the extended terminals of the secondary coil, none being manifested when it was interposed between either of the terminals and the coil, might be fully explained on the known principles of electrical tension. The state of high tension in the ends of the secondary coil, augmented by the mutual induction of the opposed surfaces with which they were connected, would cause the electricity when released from constraint to rush through the intervening electrometer wire with great violence; whereas, when the coil was interposed between the released opposite electricities, the state of tension was so diluted by the great resistance of the wire, that no heat was developed by the passage of the current. He wished to know whether he had correctly understood Mr. Hearder to state that the diameter of the iron core was of little consequence, whether it was half-an-inch or one inch. Mr. Brooke remarked that having frequently used the secondary coil for medical purposes, he found he could regulate the intensity of the electric discharge in proportion as he added to or abstracted from the bundle of wires in the coil, and he could not therefore conceive that the diameter of the core could be of no consequence.

Mr. CROMWELL VARLEY, had understood from Mr. Hearder, that the size of the iron core within certain limits had but little effect upon the induced current, and that no perceptible difference would be seen in the effects, be the iron core half-an-inch or an inch and a-half in diameter. He (Mr. Varley) had made many experiments with Rhumkorff's coils, and others, and found that although the size of the iron core had but little to do with the tension of the electricity at the termini of the secondary coil, yet if a galvanometer were put in circuit, it would be found that the quantity of electricity circulated in the primary coil was within certain limits almost in proportion to the quantity of iron constituting the iron core. He had made an experimental coil hollow, into which he could thrust a cylinder 1¾ inches in diameter. When a piece of iron tube ⅛th of an inch thick was inserted, the quantity evolved with one cell of Daniel's battery showed a deflection of 20°, when a bundle of iron wires 1¾ inches was inserted. the galvanometer showed 50°, but the tension of the electricity in either case was as nearly as possible equal. He (Mr. Varley) found that the greatest effects were produced when the magnetism of the iron was rendered invisible, as it were, by completing the magnetic circuit; for instance, by making the iron core an endless ring no polarity was visible, for, in fact, there was no place that could be called the pole, all parts being equally north and south. With such a core wrapped with primary wire, and afterwards with secondary wire, the quantity of electricity circulated in the secondary coil was more than double that which was developed when the same was cut in half; the tension or jumping distance, however, was about the same in both cases. Mr. Highton had stated that, were the secondary wire collected about the poles of the iron core, instead of uniformly all along the coil, much greater effects would be produced from the same amount of wire, because everyone knew that the magnetism was chiefly developed at or near the ends of the iron core. Mr. Varley had tested this, and found exactly the reverse; at the centre of the coil where no sensible magnetism was developed, a great deal more secondary effect was produced than at the poles, being in the ratio of about 3 to 1. With regard to the ignition of gunpowder by the spark of the machine, and its non-ignition when a Leyden jar was attached, which latter greatly increased the brilliancy and report of the discharge, Mr. Hearder stated that this difference was due to the non-development of heat in the case when the Leyden jar was attached. Mr. Varley differed in opinion from Mr. Hearder. Gunpowder was a slight conductor of electricity, and with 400 cells of Daniell's battery grains of gunpowder were easily ignited by the passage of the current through the powder itself; that this was the case was evident from the fact that 400 cells of Daniell's battery had not sufficient tension to cause electricity to jump across any interval perceptible to the naked eye. Again, Dr. Faraday had shown that the slightly luminous flame between the terminals of the secondary wire occupied a very appreciable space, and therefore it resembled the flame of a voltaic arc of short duration, whilst with the Leyden jar in circuit, the electricity which passed resembled the lightning flash, it being the momentary discharge of the electricity pent up, as it were, on the surface of the jar, this latter discharge being the flash of a quantity of electricity, occupying but a very short interval of time compared with the former. It was more luminous and larger in diameter, and, like lightning or the flash of a Leyden jar, carried a cushion of air before it, which blew the gunpowder away. The flame from the coil itself, without the Leyden jar, resembled the voltaic arc in many respects, particularly in the fact of being composed of an interior luminous wire-like flame, surrounded by a large but scarcely luminous envelope. This envelope disappeared when the Leyden jar was attached. Mr. Varley added that Rhumkorff's coil consisted of about 300 turns of No. 10 copper wire for the primary, and 30,000 turns of fine wire for the secondary coil.

Mr. Hearder, in reply, said, the length of the primary wire depended upon the character of battery employed. If a quantity battery were used, a short thick coil was preferable; but with an intensity battery a much longer wire would produce the same effects with regard to the electrical currents. Whether the primary wire were 100 feet or 150 feet in length, was of no consequence, if the battery power was properly adjusted to the resistance of the coil. The diameter of the iron core differed much in various instruments, but beyond a certain point, say about an inch, there was no advantage in increasing its size. This, however, depended upon the amount of battery power and wire employed. In reply to inquiries from Mr. Varley, Mr. Hearder stated that in the instrument with which he had experimented that evening, there were about four inches of copper wire in the secondary coil, and 150 feet in the primary coil, the former being No. 36, and the latter No. 12 guage. The diameter of the core, which was formed of a bundle of iron wire, was about one inch, and in the smaller instrument upon the table. $\frac{7}{8}$th of an inch. With reference to Ruhmkorff's coil, the external appearance would convey the idea that the whole was embedded in shellac, which was almost sufficient to deter any one from attempting to take it to pieces. He thought that we were indebted to Mr. Gassiot for having investigated its construction.

The Chairman said he had intended to offer some extended remarks upon this interesting and important subject, had the time permitted. Those who had witnessed the experiments of Mr. Hearder that evening, could not fail to be impressed with the feeling that that gentleman had taken a step in advance of anything which had yet been done, with the exception perhaps of Mr. Bentley, who had also succeeded in producing a powerful and effective electric coil, and whose presence he had hoped for that evening. The phenomena exhibited by Mr. Hearder—some of which were certainly new—would impress those conversant with the subject with the enormous scope there was for the improvement of this particular machine. He believed, except for very special purposes, this instrument would entirely supersede the ordinary electric machine, and that for the future the electric coil, under the various modifications of which it was susceptible, would be generally employed. Four points might be suggested as those to which attention must be directed by those who wished to construct or improve the apparatus in question. Firstly, the proportions of the coils, thickness and length of wires, and size of iron core. On this subject the elaborate papers of MM. Jacobi and Lenz, of St. Petersburg, and of Professor Dove, of Berlin, might be consulted with advantage. Secondly, the contact breaker, which had a much more important bearing on the efficiency of the apparatus than was generally supposed. If, for instance, the contact points were of copper, or an easily fusible metal, the effects of the secondary coil sank to a minimum, as compared with those produced when they were of platinum, an effect probably due to the fusing of the points forming a fine line of communication, and so preventing the rupture from being instantaneous. The size and proportions of the iron core were not altogether independent of the mode of breaking contact. If, for instance, with good battery power, the ordinary hammer or gravitation contact breaker of Ruhmkorff were used, the intensity of the secondary effects would be found to increase as the distance between the hammer and the iron core was increased. This was due to the circumstance that when the distance was greater a greater magnetic power was required to raise the hammer, and the core would, therefore, have time to become more saturated with magnetism, and thence to make the re-action or induced current at breach of contact the more intense. The object to be aimed at was, therefore, to give a certain degree of continuity to the contact, and to make the breach as instantaneous as possible. This was better effected by the springs of Mr. Hearder and Mr. Bentley than by the gravitation principle. Thirdly, the condenser, the size or superficial extent of which might, with advantage, be indefinitely increased, and the effects of which he believed to be the removal of the secondary current from the primary wire, so allowing the full power of the primary current to act on the secondary wire, the effects of which were, with a given battery, in the inverse ratio to the spark given at the contact breaker. Fourthly, the insulation of the coils. Probably of all the materials hitherto tried, gutta-percha would be found the best; its non-conducting power, and its elasticity were most valuable qualities; and if between each layer of the secondary coil melted gutta-percha could be spread (not an easy operation), and the whole thus formed into one block, a most efficient and durable apparatus would be formed. The Chairman, as an illustration of some effects produced by the induction coil, handed round some specimens of the results of his experiments, recently published in the *Philosophical Magazine*, (Jan. 1857,) by which invisible electrical figures were impressed on clean glass plates when these were electrified betwen sheets of tin foil by the coil, the glass plates having between them letters cut in paper or tinfoil. If the naked glass were afterwards exposed to the vapour of hydrofluoric acid the impressions were developed, and at the same time permanently etched on the glass. If the glass having the invisible electrical impressions were subjected to the collodion process, and exposed to diffused light, the impressions were developed in the collodion film, and might be fixed in the usual way. The Chairman concluded by moving a vote of thanks to Mr. Hearder for his very able communication and the interesting experiments he had exhibited.

A vote thanks was passed to Mr. Hearder.

The Secretary announced that on Wednesday evening next, the 25th inst., a paper by Mr. Alexander Redgrave, one of H. M. Inspectors of Factories, "On the Factory or Half-time System of Education, and its General Application," would be read. On this evening Lord Robert Grosvenor, M.P., will preside.

EDUCATIONAL MUSEUM AT SOUTH KENSINGTON.

The following regulations for the guidance of contributors to the Educational Museum have just been issued by the Department of Science and Art.

1. The Museum will be open free to the public, on Mondays, Tuesdays, and Saturdays; and on Wednesdays, Thursdays, and Fridays, to students and the public generally, on payment of sixpence each, or a subscription of ten shillings a year or five shillings a quarter, payable in advance.—2. Contributions forwarded for exhibition will be classified and arranged by the officers of the Museum.—3. Exhibitors will be requested to attach to their contributions descriptive labels giving the names, uses, &c., the size and form of such label to be hereafter determined.—4. It is desirable that the usual retail price should be distinctly marked on all articles sent for exhibition.—5. As it is the wish of the Committee on Education, and the evident interest of exhibitors, that the Museum should at all times represent the then existing state of educational appliances, every facility will be given for the introduction of new inventions, books, diagrams, &c., relative to education. —6. Books and other educational appliances out of date, or the utility of which may have been superseded, or articles that may have become injured, may be removed or replaced at the option of the exhibitor. 7. To prevent confusion, and the possibility of articles being removed by persons not properly authorised by the exhibitor, due notice in writing of the intention to remove articles must be given, and no book or object is to be removed until it has been exhibited at least twelve months.—8. In order to protect the property of exhibitors, no article will be allowed to be removed from the Museum without a written authority from the superintendent.—9. On Wednesdays, Thursdays, and Fridays, the books and other objects in the Museum, will be open to students and to the public for inspection and study, under such regulations as are usually found convenient in a public library.—10. A catalogue will from time to time be published, so as to keep pace as much as possible with the additions to the Museum, and the withdrawals from it.—11. Exhibitors desirous of advertising in the catalogue, may send their prospectuses, illustrations, price lists, &c., 1,000 copies at a time, and *printed in demy 8vo.*, so that they may be bound up in the catalogue. The binding will be free of cost to the exhibitor; but exhibitors will bear any depreciation in the value of the objects from their use by visitors.—12. All contributions forwarded to the Museum, to be addressed to the Secretary of the Department of Science and Art, Cromwell-gardens, South Kensington, care of Richard A. Thompson, Esq., Superintendent of the Museum.

BURKE'S FIBRE-CLEANING MACHINE.

The following is quoted from an Antigua Journal of the 10th inst., in reference to a trial of this machine:—

"The prominence which has been given within the last three or four years to the fibrous productions of the tropics, arising from the growing demand for materials both for textile manufacture as well as for rope and paper making, has had the effect, while it led to careful investigations of the nature and quality of the products with which these colonies abound, of setting the ball of scientific investigation in motion, in bringing machinery to bear upon the preparation and manipulation of the raw material. In so far as the adaptability of the various products to the purposes required related, but little labour and experiment were requisite to prove that the native Aloe (*Agave Americana*) would contrast favourably with the hemp of Russia—that the plantain (of the species *Musa textilis*) would bear comparison with the manilla of the Phillippine Islands—that the snake grass and the pine apple (the latter of the family of the *Bromelia penguin*) would be found little inferior to the Belgian flax; but the great want which was felt to exist was, machinery adapted to the peculiarities of the plants intended to be operated upon, which, while it preserved the strength and beauty of the fibres, would economise the manual labour, at all times so much needed in these islands. These difficulties the results have proved were not to be easily surmounted, and we hear of thousands of pounds having been from time to time expended, on mechanical as well chemical experiments, without the attainment of the long-sought for desideratum. The primitive method of steeping the fibrous plants in water or some other liquid to deprive it of its mucilaginous substances, or the more modern idea of assimilating the machinery requisite to be used, to the principle of the comb and the heckle adopted in the preparation of the flax, were found alike injurious and inconvenient; it was reserved for the inventive genius of Mr. Francis Burke, of the neighbouring island of Montserrat, so to prepare and adapt a machinery calculated to meet the existing requirement, and to confer untold advantages on the inhabitants of these colonies. This gentleman, after years of unceasing toil and experiments, has, at length, succeeded in perfecting an apparatus, which for simplicity of construction, and for successful operation, has equalled, not only the sanguine expectations of his friends, but must, we feel satisfied, be all that the inventor could have desired.

"An exhibition of one of these machines was afforded a few days ago at Green Castle Estate, the property of James Law, Esq., where were collected, besides a large number of practical agriculturists, and the scientific of our community, a goodly array of the public men of the Island, including his Excellency the Governor in Chief, the Lord Bishop, and the Chief Justice, all of whom we learn were highly gratified and expressed their unqualified approval. Most of the fibrous plants indigenous to the colony were operated upon by Mr. Burke in the presence of the assembled spectators with the most perfect success. We saw specimens of the fibres of the Aloe, the Plantain, the Snake Grass, and the Pine Apple, which had been turned out, without being in the least degree broken or injured by the operation of the machine, denuded entirely of all the pulpy matter or parenchyma, requiring merely the action of water to cleanse it, when it may be dried and baled ready for market. Steam power was applied in putting the machine in operation; but we learn from the little force requisite (the power used being equal to that of one horse) that either water or animal power may be made available. Mr. Burke, who has patented his apparatus in England, France, Belgium, and the United States, has recently had it exhibited before the members of the Society of Arts, where the invention elicited expressions of the highest eulogium, and induced an offer by a gentleman then present, of his readiness to purchase any quantity of the Plantain fibre at £33 per ton. Ten of these machines, we are informed, might easily be set in motion by an engine of ten horse power, each machine being capable of producing 2 cwts. of fibre per diem, while at the same time all the refuse of pulp, &c., would find a ready purchaser in the paper manfacturer. The machine may be described as consisting essentially of a pair of small feeding cylinders, between these the material is entered and is slowly carried forward upon a moving leather band, until it comes underneath a fluted cylinder revolving with great rapidity. Immediately under this cylinder, below the band, is a movable platform, working on Indian rubber, and pressing the fibrous substance upwards against the fluted cylinder, which, by its peculiar action of beating, bruising, and scraping, separates and loosens all the mucilage and vegetable matter adhering to the layers of fibre, which passes from beneath the cylinder like a riband, and only requires washing and drying to be ready for shipment. The extent of the labour required is the service of a boy, who is capable of feeding half a dozen cylinders, which number and more, Mr. Burke explained, could be easily fitted on a single machine. In view of the prospect which Mr. Burke's invention holds out, of opening up new sources of wealth and industry to these Islands of the West, without diverting from its accustomed channels the labour at present applied to the manufacture of our staple—the cane—he may be regarded as a public benefactor."

THE CLOCK AND BELL FOR THE HOUSES OF PARLIAMENT.

Mr. Loseby's letter below, addressed to the Editor of the *Journal of the Society of Arts*, being in reply to Mr. Denison's which appeared in the *Builder*, the latter is reprinted from that Journal:—

"Mr. Loseby may depend upon it that he will find some little regard to truth expedient in the long run, even if he gets people to believe him for a week without it. In justification of his foolish and malicious charge, that I designed the Westminster clock for a hammer of only 120 lbs. he now goes back to a table of sizes of bells and hammers furnished to the Astronomer Royal by the late Mr. Dent, in 1846, with which I had no more to do than Mr. Loseby himself. And of this table he knows the following things as well as I do:—

"1. The hammer there set down with 120lbs. opposite to it is not a hammer of that weight, but is the reduced weight of a heavier hammer for the angle of 35 deg.

"2. It was expressly stated there to be proposed as the hammer for a bell, not of 14 tons, like Mr. Vulliamy's 150 lbs hammer, but for a bell like the Oxford one, which is the worst large bell in England, and therefore has a much lighter hammer.

"3. That plan never was adopted by any contract whatever.

"4. It was proposed six years before I was consulted about the clock.

"5. As soon as I was consulted I prepared a new plan, with the concurrence of the Astronomer Royal, which the Company of Clockmakers themselves described as so different from Mr. Dent's former plan, that it ought to have been, in their opinion, thrown open to a fresh competition.

"He says that my statement that I contemplated a hammer of nearly eight times the power represented by him, is not confirmed by the Parliamentary papers. He knows perfectly well that that was not the place to which I referred him to find it; but to the Encyclopædia Britannica Treatise on Clockmaking, written by me in 1854, and sold by Mr. Dent. Nothing at all appears about it in the Parliamentary papers, because that and all other details were left to the judgment of Mr. Airy and myself by the contract.

"He says that Mr. Vulliamy's plan, adopted by the Company of Clockmakers, was stronger than mine, because the great wheel of their striking part was 3½ feet, whereas mine is only 3 feet. But he knows that in that plan the great wheel was not the striking wheel; and he ought to know that that was one of the most glaring defects of that most defective plan. It was actually intended to raise the hammer for a 14 ton bell by pins set in the second wheel of the train, acting on a lever consisting of a half inch round rod, where mine is 2 inches square in section.

"His rage against cast-iron wheels is only the old Clerkenwell clockmakers' prejudice, with which they have steadily resisted every improvement in clockmaking, and I shall not enter into that here. When any of them can make a turret clock, on their plan, equal in performance to Mr. Dent's cast-iron ones, it will be time enough to discuss it.

"Mr. Loseby has really outdone himself in his desire to give a finishing stroke to my plan, by saying that the government is to pay Mr. Dent for executing it, as much as they would have paid Mr. Vulliamy, if they had adopted his. Even if that were so, I do not see what the government, or the public, would have to complain of, since Mr. Vulliamy's clock (as the Astronomer Royal reported) was nothing better, in point of accuracy, than 'a large village clock,' and it was totally unfit for its work besides. But the fact is, as Mr. Loseby again very well knows, Mr. Dent's contract is for £1,900: and Mr. Vulliamy's estimate (which he never would give until he knew it could not be accepted) was £3,500.

"This is a pretty fair amount of 'fabrication' for one letter, I think.

"If Mr. Loseby prefers bad bells, like the Oxford one, and most of the large English bells, which will only bear a clapper of $\frac{1}{100}$th of their weight, or less, to good ones, like the Westminster bell and some of the great continental bells, with clappers two or three times as heavy, that is a matter of taste, on which he must have his own way. I wish the Clockmakers' Company, and the opposition bell-founders, joy of their advocate's taste, as well as his veracity. "E. B. DENISON."

Sir,—In Mr. Denison's first letter I perceived portions of irrelevant matter had been introduced, probably for the purpose of diverting attention from the principal points, and I therefore concluded my reply by setting forward the questions to be kept in view, viz.: 1st, the quantity of work which the clock now made is equal to; 2nd, the force which a good bell of 16 tons should require. These questions Mr. Denison again evades, and substitutes others of comparatively little consequence, at the same time covering the change by employing similar words; for instance, he has twisted my question of what the clock is really calculated to do into what he calculated it to do, and on the strength of the perversion, discharged quite an assortment of epithet against me, for the list now includes "fabrication," "absurdity," "blundering," "falsehood," "folly," and "malice." I have never pretended to know or to state the amount of force which Mr. Denison might imagine a clock of this size capable of, but the force which it is really equal to; and even on the question of what he contemplated it should do, he now admits that nothing concerning a hammer of 400lbs. is to be found in the parliamentary returns, although they contain the official account of all the clock plans.

Another amusing diversion which he has employed is that wherein he connects my name with obstructing improvement, and his own with advancing it, and again brings forward Mr. Vulliamy's plan for me to defend in other particulars besides that of durability, calling attention amongst other things to the fact of the hours being struck from the second hand instead of the first, but omitting to mention that his own plan has the same fault of striking from the second wheel in the quarters that Mr. Vulliamy's had in the hours, and that the quarters will have considerably the most work to do.

Once for all let me state that whatever merit or fault Mr. Vulliamy's plan possessess, I cannot accept either the credit or blame, because I have never had anything to do with the design, and in order to show which side the charge of obstructing improvement really belongs to, I need only observe that in none of the instances in which my own improvements in horology have been submitted to the many government trials they have successfully undergone, have I thought it necessary to constitute myself the judge to decide on their merits, whilst on the other hand, this is the course which Mr. Denison has systematically adopted, first during the Exhibition of 1851, when he got himself elected chairman of the jury, and awarded the principal medal to his own design; secondly, in getting himself appointed the joint referee for his design of the Westminster clock, and afterwards setting aside the other referee, by conducting the business in a manner which caused the Astronomer Royal to decline acting with him any longer, and lastly, in getting himself appointed referee to decide on the merits of his bell, and in this last instance he has already shown the use he intends to make of his appointment, by instituting as a fair test that same clapper trial of the bell in which he employed eight or nine men to exert at least twelve times more force than the clock is equal to.

My reply to the points he has numbered 1, 2, 3, 4, and 5, is this, that in referring to the table of bells and hammers in my last letter I distinctly stated it was by the late Mr. Dent, and gave ample directions for finding it with all its details; there is, consequently, no foundation for Mr. Denison to charge me with attributing some of the figures it contains to him, and concealing other portions from the public. I was aware that the bell for which Mr. Dent intended the hammer of 120lbs. was only half the size of the present one, but in addition to the fact of the Oxford bell being struck by less than half the force, I had also to keep in mind that when Mr. Dent allowed this proportion of force, he expected to have had to use one of our degenerate modern bells, because the *Times* had not then announced Mr. E. B. Denison, Q.C., to the world as a distinguished lawyer, specially raised up by Providence to restore the art of bell founding, and discover improvements in turret clocks; but if Mr. Denison is content to have the Westminster bell tested by a standard no higher than that of our modern bells, after all he has had to say against them, and the expectations he has raised, there would be no objection, so far as the bell alone is concerned, to allow him an equal proportion of force, but his lowest demand at present is for eight times the proportion required by the Oxford bell, instead of only twice, and I have already remarked that the clock would be quickly worn out by even twice the force, and that 120lbs. for the hammer, and 6 inches for its fall, is the greatest quantity of work which a clock of this size and material should be allowed to do.

There appears to be some difference of opinion between us as to whether certain qualities in bells should be considered good or bad; for instance, I have had the notion that the best bell would be that which should produce the finest quality of tone, and the greatest volume of sound with the least blow of the lightest weight of bell. Mr. Denison states the opposite view, and forthwith condemns the Oxford bell as the worst large bell in England, on account of its only requiring a light blow, thus making the quality which I had regarded as its greatest merit its worst fault.

I stated in my last that Mr. Denison had so managed matters, that the government would have to pay as much for the cast iron clock as though it had been made of gun metal, and I perceive that he has now added a few words which pervert the sentence. My reason for the statement was not on account of any estimate from Mr. Vulliamy, as Mr. Denison makes it appear, but because Mr. Dent had actually agreed to construct the clock with gun metal wheels throughout for the sum of £1,600, until Mr. Denison arose and got the original estimate set aside, the material altered from gun metal to cast iron, and the contract increased to £1,900. All this appears so clearly in the parliamentary returns, that I did not consider it necessary to add any explanation at the time.

I cannot close this letter without adverting to a pamphlet just published by Nichols and Son, Parliament-street, which shows that Mr. W. L. Baker, C.E., of Glasgow, having conceived the idea of gradually turning bells in the stocks, to present a fresh position to the clapper and hammer, and patented several methods of carrying out the principle, offered the plan to Mr. Denison for adoption in the Westminster bell, and received from him a refusal; but this refusal appears to have been given with a view to pirate the inventor's ideas, and deprive him of any advantage to be derived therefrom, for Mr. Denison has not only adopted the principle in the Westminster bell, without the knowledge of Mr. Baker, but claimed it as his own, and the injustice of the whole proceeding is not diminished by the fact of its being the only new and good principle which the bell contains.—I am, &c., E. T. LOSEBY.

London, January 21, 1857.

TONNAGE AND SHIPPING REGISTRATION.

The following remarks upon this subject, having reference to a letter from Mr. Charles Atherton which was lately published in the *Journal*, have been received from the editor of the *Mechanics' Magazine*:—

We preface the remarks we shall offer on the above letter by the announcement that we must here close the controversy that has arisen on Shipping Registration between Mr. Atherton and ourselves. Our pages have been open to this gentleman to the very utmost extent that justice or courtesy can demand. The question has been well ventilated, and we know no useful object that can be gained by pursuing further a discussion which must have become wearying to our readers.

With respect to the letter itself, we must observe, that every deficiency is not necessarily a defect; and, although it may be desirable that some deficiences should be supplied, it may well be that this cannot be effected without the admission of concomitant evils which would more than compensate for the advantages gained. We therefore repeat, although for scientific purposes certain data would be very desirable, it has not yet been established that it would be advisable to supply those data by the agency of legislative enactment. We have on a former occasion defined the point at which the interference of Government in commercial affairs should cease. It is the duty of government to take care that no injustice should be done to the public by the immunities of any particular class, and that the incidence of tolls and dues peculiar to a particular class should be as fair as possible; but it is not the duty of government to hamper the freedom of trade by the exercise of unnecessary and vexatious control, under the pretence of protecting the unwary from the machinations of the crafty, or any other pretence whatever. Interference of this kind may be well enough calculated for the meridian of St. Petersburg, Vienna, or Naples; but in the meridian of London, where the advantages to commerce of placing private enterprise under as few checks as the welfare of the whole body politic will admit, have been so long and so beneficially experienced, we do not anticipate much favour for the proposal to extend the mantle of special protection over individual members of a class by direct interference, unless a very clear case has been made out of its necessity or its justice. Has Mr. Atherton made out such a case? Has he shown that the Mercantile Shipping Act of 1854 is fairly chargeable with the abuses with which he has charged it? We believe not.

Mr. Atherton excuses himself for not having before accepted our challenge in support of the sufficiency of the present law for certain purposes by the oracular dictum, that "there ought to be no challenge of intentions." There is a sense in which this is right enough. When an individual takes a certain part, or espouses a certain cause, we admit "that a challenge of his intentions" in so doing is generally very much to be deprecated, and is often resorted to for want of more cogent arguments. But surely the inquiry into the intentions of a law does not come under this head. The Judges of the superior Courts are employed every day in inquiring into the intentions of the legislature in passing various enactments, in order to fix the sense of those parts which may be obscure, by the general scope and tendency of the whole. We cannot conceive that any person can have an adequate idea of the meaning of any law, until he has clearly set before his mind's eye the intention with which it was proposed and passed. On the contrary, it seems to us that the first questions which a man should ask himself with regard to a law are, what objects was it intended to secure, and are its several enactments efficient for this end? Then he will be in a situation to ask, Are there other and different objects which it ought to have been the intention of the Legislature to secure, and if so, were these omitted advisedly or inadvertently? These points must be settled before the inquirer can reasonably determine whether these other objects can be fitly obtained by legislative enactment; and, if so, whether, to secure them, it will be necessary to alter the existing law, or merely to add to it. The knowledge of the intention of a law, then, is a *sine quâ non* to the right appreciation of it.

We repeat, therefore, with no invidious "challenging of intentions," that the one object which the registration clauses were meant to secure was, the impartial and fair incidence of tolls on all merchant ships. This object, we assert, the law attains as far as can reasonably be expected, and this Mr. Atherton denies. In support of his case, he advances three several deductions which, he asserts, the "admitted deficiencies" of the law establish. These are—1. That a vessel of 100 registered tons may be so constructed as to carry 1,000 tons weight of cargo. 2. That a vessel of 1,000 registered tons may be so constructed as not to be able to carry more than 500 tons weight of cargo. 3. (which seems a little inconsistent with the two former allegations) that as "every ship, *without exception*, measured and registered under the present law, can carry 250 tons weight for every 100 tons register, unwary persons may be called on to pay 5s. per ton on the score of light dues, &c., on the goods they ship, whereas the equitable charge should be no more than 2s. per ton."

The first thing that strikes us in these allegations is, that they all three deal with merely hypothetical cases. Mr. Atherton does not venture to tell us that such ships as he instances *ever have been* built, or are ever *likely to be built*; in fact, his third assertion quite disposes of the question of fact. It is very possible that in these oracular cases he may have in view another choice example of "*Reductio ad Tub.*" If so, we wish him joy of it—much good may it do him! We assert, on the contrary, that so long as ships are intended to conform to the ordinary conditions of ships—to float upon the sea without toppling over the moment they reach their natural element—to encounter storms—to fetch and carry a reasonable amount of cargo in a reasonable time—there must be a proportion between the portion of the ship out of the water and that immersed, varying within tolerably narrow limits. There cannot be an undue amount of top-hamper without destroying its commercial value; and it is, therefore, only reasonable to expect that ships will go on being built capable of carrying, on the average 250 tons weight for every 100 tons register, rather than 1,000* tons, or only 50 tons. Practical men will smile at the idea of being asked to alter the law to meet the case of tubs or arrows! Mr. Atherton is *so very scientific* that he cannot acquit a law of injustice and murder, unless it makes provision for vessels which all laws of science and all deductions of experience would condemn as being no ships at all; which no shipbuilder would be so crazy as to construct, and no shipowner such an idiot as to buy! Unfortunately for him, Government and Parliament are in the habit of looking upon questions on which legislation is demanded in a practical light; and so long as the shipping interest are satisfied with the "reasonable fairness" of the present law, and so long as shipowners and shipbuilders are agreed to build "*ships*"—and not tubs and other monstrosities, which could only result in disappointment to the customer and a bad name and consequent ruin to the builder—we fear they will hardly discover in the cases instanced by Mr. Atherton "public abuses" which it is their imperative duty to put down.

With regard to Mr. Atherton's third allegation, that the unwary shipper of goods may be made to pay 3s. more per ton than he ought on the plea of dues, we can hardly think he is in earnest in urging this as an objection to the law. Of course, the shipowner must take the dues into his calculation, together with all other expenses in determining the freight per ton which he must charge on goods. We poor simple folk have been in the habit of thinking that the price of freight is very much like other prices—that of corn, for example—regulated by the demand and supply, and by the quality of the article. We had imagined in our ignorance that, in the City, the price per ton of freight was as well known, and subject to the same kind of conditions, as the prices of wheat, barley, and oats, in Mark-lane! We were not aware that when a merchant applied to an owner to ship goods, he was informed that the price of carriage is so much, but I must charge you so much additional for light and other dues! Mr. Atherton may be in possession of information on this point, to which we have no access, and which might correct our ignorance. If so, we beseech him, for pity's sake, to produce it. Do not let us go on all our life under the absurdly ignorant notion that, whereas the farmer does not say to the corn-factor, My wheat is 60s. a quarter, but then I pay a tithe-rent charge of so much an acre, on 150 acres, I must, therefore, charge you 3s. a quarter beyond the professed market price; so neither does the shipowner charge so much per ton freight, and make extra charges for specific outgoings. It really would be a charity to let us know that such vulgar notions as demand and supply, in conjunction with prime cost and the aggregate outgoings, are not the only things which regulate the cost of carriage of goods on shipboard.

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* Our readers will perceive that we refute Mr. Atherton by the aid of his own figures. There is, however, a monstrous fallacy and confusion of terms running through his whole argument, which ought to be exposed. A vessel of 100 tons register has an internal capacity of 10,000 cubic feet; 250 tons measurement, at the usual rate of 40 cubic feet to the ton, will exactly occupy the space of 10,000 cubic feet. Hence, Mr. Atherton tells us that *every* vessel of 100 tons register will "*hold*" 250 tons measurement of goods; which, no doubt, by filling up every nook and corner of covered-in space it could be made to do. The unwary reader would be apt to imagine that Mr. Atherton meant that the vessel could be put to sea, and perform its voyages, with this amount of goods on board; that is, with no possible place to house master, mate, or crew! He overlooks, too, the small consideration that every vessel—we might almost say without exception—would at once sink with such a load on board. Mr. Atherton has, however, saved himself by using the word "hold" instead of "carry," and has thus doubtless satisfied the argumentative "morality" of the case. The whole argument in his third objection is based on the fallacy that every ship can "carry" 2½ tons measurement for every ton register; and our readers will consequently have no difficulty in assigning it its proper value, independently of our remarks in the text. This third case is made to contrast with the two cases on which his first objections are raised. In fairness, then, he ought to have applied to them the same conditions. Does he do this? Far from it; he speaks of the "carrying" power of these, while he speaks of the "holding" power of the former. Vessels of 100 and 1000 registered tons will hold respectively 10,000 and 100,000 cubic feet; that is, at the usual rate, 250 and 2,500 tons measurement of goods, and neither more nor less. What they may safely carry, as well as what every ship "as regards the existing reality," may carry in proportion to its register, is a very different question. Mr. Atherton, whether intentionally or unintentionally, suppresses this distinction between the words "carry" and "hold," which, as we have seen is most material to the argument, and which the unwary are very likely to overlook—a sad slip in a gentleman whose moral sense is so sensitive as Mr. Atherton's is! We make no comment on the extravagance of the statement that a vessel, whatever be its build, whose internal measured space (including, as the present law does, all covered-in spaces on deck) amounting to but 10,000 cubic feet, can carry goods which, at the usual rate, would occupy a space of 100,000 cubic feet, even supposing it a steamer, and allowing that its holding power (an extreme assumption) may be increased by one half, that is, to 15,000 cubic feet! Mr. Atherton surely forgets that our pages are open to the perusal of *practical* men.—Ed. M. M.

Further, the divisor 100 was not, as Mr. Atherton seems to suppose, adopted arbitrarily, but to fulfil a condition which the shipping interest considered a *sine quâ non* in any system of registration, viz., to make the total amount of the registered tonnage of British shipping the same, at the time of passing the Act, by the new as by the old measurement, in order that British shipping might not be placed at a disadvantage, compared with foreign shipping, with regard to dues. It seems difficult to cavil at the reasonableness of this limitation. Something equivalent to the present registered tonnage, that is, a measurement reduced by a suitable divisor, must be registered for this purpose, under any system; even should that system embrace the registration of capability of carrying tons weight. If the persons shipping goods, "who don't know better," are now liable to be imposed upon, we do not see how the registration of capability of weight would help them; for, if they are so ignorant as Mr. Atherton supposes, it is not likely that they should know on which of the registered "capabilities" dues are to be levied.

Finally, Mr. Atherton addresses himself to the morality of the question; and he quotes a passage from Dr. Woolley's letter (for which we are no further responsible than as having given it a rather prominent place in one of our recent numbers) to the effect that, one who can be deluded by any uncertainty in the term "tonnage," deserves no more protection from Parliament than the simpleton in any other trade, who chooses "to buy a pig in a poke;" which sentiments he tells us has been repeatedly advanced in late numbers of the *Mechanics' Magazine;* and then, in a triumphant tone of indignation, he says, "Again, I ask, was the propagation of such morality as this anticipated and intended by the framers of the law which regulates our shipping registration?" We are not aware of the repeated inculcation of this sentiment in our later pages, nor do we recollect having offered any remark that bears any resemblance to it since our first series of articles in April. What we then said we do not repudiate, even though we subject ourselves, in consequence, to the withering blight of Mr. Atherton's indignation. Mr. Atherton is great, as we have seen, in many things—he is great in figures—he is great in imagination—he is great in science—he is great in political economy, and questions of supply and demand—but what he is greatest in is—morality. His moral sense is so largely developed, that a poor unfortunate mortal who unwittingly excites it, finds himself overwhelmed with withering sarcasm. Our readers cannot have forgotten how, in Jan. 1856, after exposing the "deficiencies of the present law," and laying to its charge all the horrors we have frequently mentioned, his moral sense carried him, *sublimi pennâ*, upon that furious onslaught on vested interests—from the Archbishop of Canterbury and the Lord Chancellor down to the farmer who *would* have protection, and the shipping interests that *would not*—which ultimately reduced him to the unpleasant necessity of offering something very like an apology to the latter. After all the bitter things that he has said of the law of 1854, we must not be very much surprised at the imputation on ourselves of inculcating bad morality.

Our bad morality amounts to this—that we are willing to leave the transactions between merchants, shipowners, and shipbuilders, to the ordinary conditions which regulate other branches of trade. The corn merchant at Mark-lane is not aided by a government officer in judging of the quality of the several grains he finds exposed there for sale—his own knowledge of his business and experience are the guides on which he must exclusively rely. Nor is the dealer in iron protected against the ironmaster by having the assistance of a government official, or government rules in determining the quality of the samples offered to his notice. So of other trades. We have ventured to express our opinion that the buyer does not stand in more need of special government protection against the seller in the case of ships than in other branches of business. There must be something to be learnt in every trade; and if Dr. Woolley means—as we suppose he does—that a merchant who is liable to imposition by reason of his being misled by the term "tonnage," has not capacity enough to insure him against imposition, however much government may protect him, we think he is not far from the mark. Are British merchants generally so little alive to their own interests, so liable to be deceived, so ignorant of their business, that they cannot be trusted to run alone without being tied by the leading strings of government, which must step in at every turn to keep them from going astray and ruining themselves? Yet, this is the head and front of our offending against morality. We resign ourselves to the merchants of Great Britain to inflict whatever penalty on us they may think fit.

Is it possible that in these three allegations lies the gravamen of Mr. Atherton's charge against the Merchant Shipping Act; that all that can be brought against it consists in three hypothetical cases, which are all either contrary to the nature of things, or inconsistent with the conditions of trade? Can it be on these grounds that he clamours for its repeal? In that case, he must be a sanguine man indeed to hope for success in his present raid.

Home Correspondence.

SILK WORMS.

Sir,—It may be interesting to Mr. Bashford to know, that M. and Mdme. André Jean, who have obtained the gold medal from the French "Societé d'Encouragement," for improvements in the rearing of silkworms, attribute their success entirely to a strict observance of the following rules:—

1. To prevent all breeding between the offspring of the same parent for three, four, or even more generations.
2. To select with the greatest care the worms intended for breeding.
3. To give, if possible, still greater attention to the choice of the male (stallions), as the influence of the male, in silkworms at least, is found to be much the more powerful.

If these principles are observed, the race chosen is of little importance. M. and Mdme. Jean commenced with the race called "Sina," and raised it without crossing from a state of acknowledged inferiority to a pitch of excellence unequalled in France. The cocoons are remarkable for size and regularity of form, the thread for extraordinary length, fineness, whiteness, and brilliancy.

A committee appointed by the Society, took ground in the neighbourhood of Paris, in order to test the new method themselves. The result of the experiment, conducted in an unfavourable temperature, and under favourable circumstances, was the following report:—

"La nouvelle methode est applicable, sans la moindre perturbation, et sans dépense particulière, dans toutes les localités ou l'industrie séricole se pratique. La possibilité d'améliorer les races de vers à soie de manière à changer leur constitution, et à la rendre susceptible de résister à la plupart de causes morbides, nous parait également démontrée."

More particulars will be found in "Cosmos" for Jan. 30, 1857, from which the above particulars are abstracted.—I am, &c.,

WILLIAM RADFORD.

Proceedings of Institutions.

BERKHAMPSTEAD.—The Committee of the Mechanics' Institute, in presenting the eleventh annual report of its proceedings, congratulate the members upon its continued prosperity. While, owing to removal and other causes, a decrease will be found in the number of honorary members, there has been a steady increase in the number of those whose benefit is chiefly intended. The present number of members is 20 honorary and 127 ordinary, in all 147; being a decrease of 8 in the number of honorary, and an increase of 19 in the number of ordinary; in all an increase of 11 over that of last year. A large accession has been made to the library, the greater portion of the proceeds of the fête held in 1855 having been expended in the purchase of books. The number of volumes thus purchased is 55. The excess in the number of volumes over that stated in the report of last year is, however, to be attributed chiefly to the liberality of W. Ford, Esq., who generously contributed 95 volumes. The library contains at present about 630 volumes, and there has been an increased demand for books. About 100 members have availed themselves of the use of the library, and the average issue for the year has been ten volumes to each person. Several lectures were given during the season. The Committee acknowledge their obligations to the Rev. J. R. Crawford for his class instructions in chemistry, which have been given weekly during the season. The fête and summer holiday held in the Castle grounds on the 25th of June last happily proved of great service in augmenting the funds of the Institute. It is with much pleasure that the Committee have to report the proceeds of it to be £40 9s. 1½d. The following gentlemen constitute the officers and committee for the ensuing year:—*President*, Rev. James Hutchinson; *Vice-President*, Rev. J. R. Crawford; *Treasurer*, Rev. F. B. Harvey; *Secretary*, Mr. Charles Pearson; *Librarian*, Mr. Henry Nash. *Committee:* Mr. Butterfield, Rev. J. W. Cobb, Mr. J. Osborn, Rev. W. Hodge, Mr. Crew, Mr. Read, Mr. Sear, Mr. Healey, Rev. T. Stanion, Mr. Eddy, Mr. W. Nash, Mr. Martin.

CARLISLE.—The annual soirée of the members and friends of the Mechanics' Institute was recently held in the Lecture Hall. There was a numerous attendance. The Mayor (G. Mounsey, Esq.) presided; and among other gentlemen present were R. Elliot, Esq., M.D., A. Davidson, Esq., J. C. Ferguson, Esq., Mr. J. A. Cockburn, Mr. Wilks, Mr. C. P. Hardy, Mr. Wills, Mr. Thorpe, Mr. J. Sewell, Mr. Macknight, Dr. Rae, Mr. T. James, &c. After addresses from the Mayor and Mr. J. A. Cockburn, Mr. C. P. Hardy proceeded to give some account of the present state of the Institution. The library, which was the main feature of the Institution, contained nearly 4,000 volumes, treating upon all subjects. During the past year these 4,000 volumes had been in circulation in this degree:—Books on history, biography, and science, 5,916; periodicals, 1,682, poetry and novels, 5,362. It was therefore very gratifying to find that in the more solid class of literature the largest number of books by 600 had been in circulation. Altogether, there had been 12,960 volumes of books in circulation among the members during the past year. There had also been in connection with the Institution a drawing class, a phonetic class, a French class, and a medical class; and the band had just been resuscitated. The Committee had assisted the chemical class to purchase a small laboratory; and the accounts received of the progress of the pupils were very favourable. The drawing class had died away, probably on account of the establishment of the School of Art. The Institution possessed another advantage which was only participated in by another in the town—and that was its connection with the Society of Arts.—Dr. Elliot then addressed the meeting, advocating the organization of systematic teaching, and was followed by Mr. Wilks, who said this was the more important, since the establishment of the Society of Arts' Examinations. Dr. Rae, Mr. T. James, Mr. John Sewell, Mr. J. C. Ferguson, and other gentlemen, then addressed the company, and the usual votes of thanks were passed. The meeting was concluded with a dance.

CROSBY HALL EVENING CLASSES.—Mr. Thomas Brodribb and Mr. Edward Chaplin, two of the members of the evening classes, have been appointed clerks of the third class in the Education Department of the Privy Council, having passed the examination before the Civil Service Commissioners, mentioned in a recent number of the *Journal*. This is the second occasion upon which the Lord President has placed at the disposal of the Rev. Charles Mackenzie, as hon. sec., the privilege of nominating members of the Institution as candidates for clerkships. Mr. F. R. Reynolds was successful on the former occasion.

ROYSTON.—The annual general meeting of the members of the Institute was held on Monday evening, 19th January, F. N. Fordham, Esq., in the chair. The Secretary read the report. The total income of the past year was £99 9s. 1d.; the total expenditure £94 0s. 7d., leaving a balance of £5 8s. 6d. in the hands of the treasurer. There were 11 life members (two of whom, the Right Hon. the Earl of Hardwicke and the Rev. L. Vernon Harcourt, were elected during the year through donations of £10 each); 7 honorary members, each subscribing annually £1 or upwards; 190 ordinary members; of these 57 belonged to the class of mechanics, domestic servants, and young persons under eighteen. Eleven lectures were delivered during the year, and 71 volumes were added to the library. The Rev. R. SHAEN observed that no mention was made of any classes; this he regretted, and he hoped that an effort would be made to form some. The Secretary said that the subject of class instruction had not escaped the notice of the committee, and he trusted that next autumn a systematic attempt would be made. Other gentlemen then addressed the meeting, and the following officers for the year 1857 were elected:—*President*, the Right Hon. the Earl of Hardwicke; *Vice-Presidents*, Valentine Beldam, Esq., John G. Fordham, Esq., Rev. L. Vernon Harcourt, John Phillips, Esq. The other officers of the previous year were re-elected.

PARLIAMENTARY REPORTS.

SESSIONAL PRINTED PAPERS.

Delivered on 5th February, 1857.

Par. No.
I. Bill—Judgments, Execution, &c.
Turnpike Trusts (Income and Expenditure)—Abstract of Statements.
Siam—Treaty of Friendship and Commerce.
France—Convention relative to Communication by Post.
War with Russia—Protocol signed at Paris, January 6th, 1857.

Delivered on 6th February, 1857.

Factories—Reports of the Inspectors (half-year ending 31st October, 1856).
Poor Relief (Scotland)—11th Report of the Board of Supervision.

Board of Public Works (Ireland)—24th Report.
Newfoundland Fisheries—Convention.
Belgium (Postal Arrangements)—Convention.

Delivered on the 7th and 9th February, 1857.

1. Public Income and Expenditure (Balance Sheet)—Account.
7. Factories—Return.
10. Tonnage of Vessels—Returns.
16. General Committee of Elections—Mr. Speaker's Warrant.
2. Bills—Ionian Subjects' Commissions.
3. Bills—Norfolk Island (Ecclesiastical Government).
China (Proceedings of Her Majesty's Naval Forces at Canton) Papers.
Agricultural Statistics (Ireland)—General Abstracts.
Agricultural Statistics (Scotland)—Report.
Queen's University in Ireland—Report.

Delivered on the 10th of February, 1857.

6. Metropolitan Improvements—Statement.
12. East India (Government of Oude)—Copy of a Letter.
5. Bill—Passing Tolls.

Delivered on 11th February, 1857.

13. Ecclesiastical Commission (Ireland)—Report and Account.
19. Harbours, &c., Bills—Report of the Board of Trade.
20. Naval Estimates.
21. Post-office Department (Packet Service)—Estimate.
8. Bills—Commons Inclosure.

SESSION 1856.

437. Pauper Children—Return.

Delivered on the 12th February, 1857.

22. Mr. James Sadlier—Copies of Warrants, &c.
33. Abstract of Army Estimates.
7. Bills—Transportation and Penal Servitude.
10. Bills—Royal Marine Forces.

Delivered on the 13th February, 1857.

14. Emigration (North American Colonies)—Copies of Despatches.
32. Public Income and Expenditure for three quarters—Account.
14. Bill—Chief Constables.
Pitcairn's Island (Removal of Inhabitants to Norfolk Island)—Correspondence.

Delivered on the 14th and 16th February, 1857.

3. Customs Duties—Return,
5. Queen Anne's Bounty—Account.
9. Traffic with France—Return.
11. Oxford University—Copies of Four Ordinances.
15. Constables—Rules and Regulations.
18. County Courts—Treasury Order.
31. Lunacy—Account.
34. Acts of Parliament—Return.
43. Paupers—Returns.
37. Mr. James Sadleir—Copies of Reports.
9. Bills—Chatham Lands, &c.
12. Bills—Ecclesiastical Corporations.
13. Bills—Sale of Beer, &c.
15. Bills—Church Rates Abolition.
21. Sugar and Tea Duties—To be proposed by the Chancellor of the Exchequer.
Operations in the Canton River—Correspondence.

MEETINGS FOR THE ENSUING WEEK.

MON. Actuaries, 7.
London Inst., 7. Mr. J. N. Hearder, " On Voltaic Electricity."
Architects, 8.
Geographical, 8½. I. Capt. S. Osborn, " On the Geography of the Sea of Azov, the Putrid Sea, and adjacent coasts, with remarks on their commercial future." II. General Jochmus, " Proposed Canals in Asia Minor, between the Lake of Sabanja, the river Sakaria, and the Gulf of Nicomedia." III. " Expedition up the Nile, under M. le Comte d'Escayrac Lauture."
TUES. Royal Inst., 3. Prof. Huxley, " On the Sense of Vision."
Civil Engineers, 8. Mr. T. Dunn, " On Chain Cable and Timber Testing Machines."
Med. and Chirurg., 8½.
Zoological, 9.
WED. London Inst., 3. Mr. E. W. Brayley, " On Mineralogy and Crystallography."
Society of Arts, 8. Mr. Alexander Redgrave " On the Factory or half-time System of Education, and its general application."
Geological, 8. I. Prof. Owen, " On the Dichobune ovinum from the Isle of Wight." II. Prof. Ansted, " On the Copper-veins of Tennessee, U.S."
Archæological Association, 8½.
THURS. Royal Inst., 3. Prof. Tyndall, " On Sound."
Royal Society Club, 6.
London Inst., 7. Dr. R. E. Grant, " On the Natural History of Extinct Animals."
Antiquaries, 8.
Royal, 8½.
FRI. Royal Inst., 8½. Prof. Faraday, " On the Conservation of Force."
SAT. London Institution, 3. Mr. T. A. Malone, " On Experimental Physics, chiefly in Relation to Chemistry."
Royal Institution, 3. Prof. Phillips, " On the Origin and Progress of Life on the Globe—Vertebrata."
Medical, 7. Annual Election.

PATENT LAW AMENDMENT ACT.

APPLICATIONS FOR PATENTS AND PROTECTION ALLOWED.

[*From Gazette, February 13th*, 1857.]

Dated 19th November, 1856.

2735. Thomas Hindle, Blackburn, Lancashire—Improvements in the manufacture of textile fabrics.

Dated 21st November, 1856.

2756. Carl Heinrich Julius Wilhelm Maximilian Liebmann, Fartown, Huddersfield—Improvements in the purification of water, and in the reparation of materials employed therein. (A communication.)

Dated 11th December, 1856.

2932. Joseph Chatwin, Birmingham—An expanding compensating slide for sustaining gas and other lights, also applicable for other similar purposes.

Dated 19th December, 1856.

3011. John Murdoch, Dundee—An improved ships' main-pump, applicable to other purposes also.

Dated 20th December, 1856.

3012. Henry Moorhouse, Denton, near Manchester—Improvements in self-acting signals for railways.

Dated 9th January, 1857.

83. John Bagshaw and John Paine Harris, Belstead, Suffolk—Improved medicinal mixtutes, adapted for curing diseases of cattle.

Dated 10th January, 1857.

92. John Francis Porter, 11, Park street, Westminster—Improvements in the manufacture of bricks and other articles of clay and brickearth, or of the like materials.

Dated 24th January, 1857.

214. Patrick Henry Sharkey, Liverpool—Improvements in the construction of scale beams or balances.
216. James Harris, Hanwell, Middlesex—An improved method of stopping or retarding railway carriages and trains, locomotive and stationary engines and machinery, together with certain apparatus which may be employed therein.
218. Charles James Wiggs, 32, Chester street, Kennington—An improved apparatus for feeding or supplying steam boilers with water.
220. Andrew McOnie, Glasgow—Improvements in the construction of centrifugal machines or " hydro-extractors" used for the manufacture of sugar and other purposes, and in the arrangement of appliances to give motion to such machines by steam-power.
222. William Stubbs, Liverpool, and James Burrows, Wigan—Improvements applicable to water-closets.

Dated 26th January, 1857.

224. John Fortescue, 3a, Charles-street, Middlesex Hospital—Improvements in the construction of the furnaces of bakers' ovens for the purpose of consuming smoke, which improvements are also applicable to the consumption of smoke in other furnaces.
228. Richard Archibald Brooman, 166, Fleet-street—Improvements in the preparation of woollen hats, bonnets, and bodies for hats and bonnets. (A communication.)
230. William Henry Brown, Portsea—Improvements in coffins.
232. Edward Highton, Gloucester-road, Regent's-park—Improvements in electric telegraphs.

Dated 27th January, 1857.

236. Thomas Watson, Baxenden, near Accrington, and Thomas Singleton, Over Darwen—Improvements in looms.
238. William Allen Turner, 1, Clarges-street, Piccadilly—Improvements in the manufacture of starch.
240. George Tomlinson Bousfield, Sussex-place, Loughborough-road—Improvements in coating iron or other metals with tin. (A communication.)

Dated 28th January, 1857.

242. Colin Hunter, Burnside, Antrim, Ireland—Improvements in bleaching or cleansing textile fabrics or materials and materials used for making paper.
244. Robert Harlow, Stockport—Improvements in apparatus to be applied to steam boilers.
246. Joseph Harris, Bolton—Improvements in lighting gas for illumination.
248. Thomas Cooke, 1, New-street, Portland-town—Improvements in ventilators for omnibuses, and in apparatus for actuating the same.
250. Richard Archibald Brooman, 166, Fleet-street—An improved protective matting or fabric for sheltering plants, shrubs, and other vegetable productions, pits, frames, and other similar structures, together with machinery for manufacturing the same, and the mode of supporting it when in use. (A communication.)
252. Richard Archibald Brooman, 166, Fleet-street—An improved method of elevating water and other liquids. (A communication.)
254. William Grant, 5, Newnham-street, Edgeware-road—Improvements in the manufacture of hurdles and gates.
256. Arthur Clark, 83, High-street, Southampton—Improvement in signal lamps.
258. George Edward Dering, Lockleys, Herts—Improvements in lighting and warming trains of railway carriages.

Dated 29th January, 1857.

260. Charles Edward Symonds, 56, Stones End, Southwark—Improvements in the manufacture of oxide of lead and its salts.
261. William Heywood, Manchester—Improvements in boilers for generating steam.

262. Arthur Malins, Birmingham—A new or improved method of ornamenting castors for furniture, lamps, chandeliers, cornices, and cornice-ends, curtain-bands, and curtain-pins.

263. George Sampson and Joseph Sampson, Gordon-street, Bradford, Yorkshire, and Elijah Ledger, Lofthouse, near Wakefield—Improvements in apparatus for effecting the folding or rigging of woven fabrics.

264. Samuel Jay and George Smith, 246, Regent-street—An improved hood or covering for the head, capable of being used either separate from, or in combination with, other garments, such as cloaks, mantles, capes, dressing gowns, and other entire or partial coverings for the human body.

265. Charles De Bussy, 45, Mornington-road—The reduction of zinc ores.

266. James Roderick Mc Donald, Hamburg—Improvements in the manufacture of india-rubber overshoes. (A communication.)

267. William Weild, Manchester—Improvements in looms for weaving pile fabrics, part of which improvements are applicable to looms for weaving other fabrics.

Dated 30*th January*, 1857.

268. Pierre Ernest Lavaud de Lavigeries 39, Rue de l'Echiquier, Paris—Certain improvements in the manufacture of comforters, scarfs, and other like coverings for the neck.

269. Fames Farrar, Bury, Lancashire—Improvements in apparatus for regulating the pressure and flow of gas.

270. John Talbot Pitman, 67, Gracechurch-street—An improvement of the better organization of the instrumental music scale. (A communication.)

271. James Thom, Lambeth—Improvements in the construction and mode of fixing artificial teeth.

272. Samuel Montagu, 21, Cornhill—Improvements in packing cases.

273. James Russell Chibnall, Westminster—An improved method of burning or consuming smoke.

274. Charles Lenz, Fenchurch street—An improvement in the manufacture of cast steel.

275. Thomas Ellis, Ty Mawr, Pontypridd, Glamorganshire—Certain improvements in the preparation of india rubber and gutta percha by combining therewith other materials.

276. Alexander Wright, Newcastle, Staffordshire—An improved manufacture of malt.

277. Frederick William Campin, 156, Strand—The manufacture of a certain textile fabric, termed by the inventor "tissu courroie." (A communication.)

278. Isaac Holden, St. Denis, near Paris—Improvements in washing and drying wool and other fibres, part of which improvements is applicable when connecting together lengths of leather for other purposes.

279. Isaac Holden, St. Denis, near Paris—Improvements in combing wool and other fibres.

280. Isaac Holden, St. Denis, near Paris—Improvements in preparing and combing wool and other fibres.

281. Isaac Holden, St. Denis, near Paris—Improvements in carding wool and other fibres.

282. Henry Smith, Little Hampton-street, Birmingham—Certain improvements in window price-tickets, and which said improvements are also applicable to the ornamenting and prizing the wrappers or paper boxes for holding fancy and other goods, also in the mode of attaching or suspending window tickets.

283. Thomas Affleck, Ceylon, at present residing in Manchester—Improvements in machinery or apparatus for pulping coffee.

284. James Owen, Worsley, Lancashire—Certain improvements in machinery or apparatus for the prevention of accidents in ascending and descending shafts of mines, which said improvements are also applicable to hoisting and other lifting machines.

285. John Allin Williams, Baydon, Wilts—Improvements in machinery or apparatus for ploughing or tilling land by steam power.

Dated 31*st January*, 1857.

286. Adolph Hensel, 4, Stafford-place, Pimlico—Making compressed yeast.

287. Richard Appleby, Newcastle-on-Tyne, Northumberland—Improvements in washing machines.

289. William Hargreaves, Bradford, Yorkshire—Improvements in machinery for preparing and combing wool, hair, silk, cotton, flax, and other fibrous substances.

290. Henry Whittles, Vicar's Moss, and Robert Schofield, 5, Nuttall-street, Rochdale—Improvements in the construction of the slide valves of steam engines, and in the mode of working the same, for the better regulation of the vacuum in the cylinders thereof, economizing fuel, and for ensuring safety and steadiness of such machines whilst in action.

291. William Edward Newton, 66, Chancery-lane—Improvements in the manufacture of buttons. (A communication.)

292. John Mayo Worrall, Salford—An improvement in finishing certain descriptions of fustians called "cords" and "thick-sets."

293. Daniel Cooper and Thomas Wood Heaton, Manchester, and Thomas Lee Langshaw, Salford—An improved apparatus applicable to the purposes of ventilation.

294. Daniel Howarth, Manchester—The application of a substance, substances, or composition, not hitherto used, for sizing or preparing woollen or worsted yarns or warps for weaving.

295. Astley Paston Price, Margate—Improvements in the separation of gold from certain auriferous mixtures, compounds, and products.

296. William Dray, Swan-lane—An improvement in ploughs.

Dated 2*nd February*, 1856.

297. William Henry Holding and James Robert Casbay, Chatham—Improvements in the manufacture of soap.

298. Cotton Symonds, Liverpool—Improvements in ships' night signals.

299. John Middleton, Calais—Improvements in consuming the smoke of furnaces.

300. Richard Robinson, Salford—Improvements in machinery or apparatus for finishing yarns or threads.

301. Jean François Dudebout, 39, Rue de l'Echiquier, Paris—Certain improvements in looms for weaving.

302. Brook Hodgson and John Carter, Halifax—Improvements in apparatus for introducing the pile wires used in weaving Brussels carpets and other piled fabrics.

304. Matthew Andrew Muir and James McIlwham, Glasgow—Improvements in moulding or shaping metals.

305. Robert Morrison, Newcastle-upon-Tyne—Improvements in steam boilers.

Dated 3*rd February*, 1856.

306. Thomas Cowburn, Manchester, Jonathan Preston, Pendleton, Lancashire, and Jeremiah Shetlock, Salford—Improvements in apparatus for regulating and indicating the pressure of steam and other fluids.

307. Thomas William Rayner, Saint George's East—Improvements in cocks and valves.

308. James Hunt, the Brades, Staffordshire—Certain improvements in shovels and spades for general use.

309. Florentin Garand, Paris—Improvements in transmitting motion and means of stopping it immediately.

310. William Lund, Fleet-street—Improvements in securing cases containing bullion and other valuable property, parts of which are applicable to the securing of bales and other packages.

WEEKLY LIST OF PATENTS SEALED.

February 13*th.*

1905. Peter Augustin Godefroy.
1908. Henry Columbus Hurry.
1914. William Hargreaves.
1916. David Chalmers.
1919. Samuel Lilley.
2009. Jean Baptiste Feauveau and Louis Alexander Legrand.
2013. John Brown.
2020. Charles Goodyear.
2049. James Picken.
2145. John Henry Johnson.
2157. George Cranstoun Trotter Cranstoun, Geo. Young, and John Lovell.
2191. Thomas Greenwood.
2230. Alfred Vincent Newton.
2231. William Johnson.
2386. George Heppell.
2656. John Henry Johnson.
2959. William Beevers Birkby.
2969. Archibald Turner.
2989. William Edward Newton.

February 17*th.*

1933. Henry Forfar Osman.
1951. Joseph Hacking and William Wheeler.
2062. Benjamin O'Neale Stratford.
2063. Rd. Archibald Brooman.
2089. John Fowler, junr.
2317. William Johnson.
2645. James Somerville.
2759. Frederic Ludewig.
2841. Edward Jackson Emmons.
2878. Ebenezer Daggett Draper and George Draper.
2919. John Robinson Scartliff.
3000. Joseph Bower.

Patents on which the Third Year's Stamp Duty has been Paid.

February 11*th.*

428. Edward Massey.

February 12*th.*

351. John Burt Smith and Edward Smith.

February 13*th.*

361. Patrick O'Connor.

February 14*th.*

368. John Wren.
375. John Davie Morries Stirling.
378. Thomas Fawcett, junr.
388. Moses Poole.
393. Edward Loysel.
424. William Edward Newton.
429. Samuel Colt.
452. Edward Hammond Bentall.
455. Auguste Edouard Loradoux Bellford.

WEEKLY LIST OF DESIGNS FOR ARTICLES OF UTILITY REGISTERED.

No. in the Register.	Date of Registration.	Title.	Proprietors' Name.	Address.
3943	Feb. 14.	The West-End Collar.....	Joseph James Welch and John Margetson	17, Cheapside.
3944	" 16.	An Air-conductor Hat for Tropical Climates	Mander and Allender...............	Liverpool.
3945	" 17.	The Signaliser..................................	Wm. Gascoigne Shaw...............	Kingsland.

Journal of the Society of Arts.

FRIDAY, FEBRUARY 27, 1857.

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SPECIAL GENERAL MEETING.

Thursday, Feb. 19, 1857.

A Special General Meeting of the Society, duly convened for the purpose of altering certain of the Bye-laws of the Society, and making new Bye-laws, was held on Thursday, the 19th inst., the Rev. Dr. Booth, F.R.S., Treasurer, in the chair, when it was unanimously resolved that the following additions be made to the existing Bye-laws, viz.:—

Union of Colonial Scientific and Literary Institutions.

Any Institution, established in a British colony, or in the British possessions in India, for the advancement of Literature and Science, or for the encouragement of Arts, Manufactures, and Commerce, may be admitted into Union.

It shall be the duty of the officers of the Society of Arts to correspond with the secretaries of such Associated Colonial Institutions, on matters relating to their recognised objects.

The productions or manufactures of a colony, transmitted by a Colonial Associated Institution, shall receive all due publicity, by means of the Society's Exhibitions, publications, and discussions.

The weekly *Journal* of the Society, with its other publications, shall be duly forwarded to every Associated Colonial Institution, and a portion of the columns of the *Journal* shall be reserved for colonial discussions and correspondence.

Whenever any member of an Associated Colonial Institution, bearing a letter of introduction from its Secretary, shall visit London, he may enjoy the usual privileges of a corresponding member of the Society of Arts during his stay, and may have his letters addressed to him at the Society's House in the Adelphi.

The Council will afford their advice and assistance to any Colonial Associated Institution which may desire to obtain in England or France any scientific or educational apparatus, and will obtain and furnish to any colonial associated Institution reports on any produce sent over for examination.

A Colonial Associated Institution shall have the privilege of purchasing books through the Society's agency on the same scale of reduction as is now granted to Home Associated Institutions.

The system of examination proposed to be instituted by the Society of Arts shall be extended so as to embrace candidates who shall have duly attended classes at Colonial Associated Institutions, and certificates of merit shall be awarded by the Society's examiners on examination papers duly authenticated and remitted from the Colonies.

A Colonial Institution may be admitted into Union on the same terms as a Home Institution, namely, an annual payment of two guineas.

Honorary Local Secretaries.

To multiply the centres of the Society's operations, and to direct the energies of many who are prepared zealously to aid it, the Council may invite gentlemen of standing and of influence in their respective neighbourhoods to undertake the office of Honorary Local Secretary of the Society of Arts.

The Honorary Local Secretaries shall receive the Society's *Journal* and other published documents from time to time; and the facilities of an office for receiving and forwarding letters, books, &c., shall be afforded them at the Society's House in the Adelphi.

The Honorary Local Secretaries will be expected to advise the Council on such matters as may be submitted to them, and to afford generally their aid in promoting the objects of the Society.

The Honorary Local Secretaries shall go out of office annually, with the Council and Officers, but may be reappointed after the annual election of the Council of the Society. Their names shall be published with those of the President, the Council, the Board of Examiners, the Committees of Reference, and the Officers of the Society.

The Board of Examiners.

To carry into operation the system of Examinations established by the Society, a Board of Examiners shall be elected from year to year, in manner and form following:—

On the first Wednesday in November, in each year, the Secretary shall summon all the members of the Board of Examiners to a meeting, due notice thereof having been previously given; and the members assembled, three being a quorum, shall proceed to nominate the persons whom they propose to be members of the Board of Examiners for the ensuing year.

The Secretary shall cause a list of the names, thus proposed, to be printed and sent to each member of the Board duly summoned, at the same time, to attend a meeting of the Board of Examiners on the second Wednesday in November. The Board of Examiners shall then proceed to select, by ballot, the persons who are to constitute the Board of Examiners for the ensuing year. No person shall be so selected unless he shall have had a majority of the votes of the persons then present and voting.

The Chairman of the Board of Examiners shall certify under his hand to the Council the names of the persons so selected to act as the Board of Examiners of the Society of Arts. The list of selected names being submitted to the Council duly summoned, for confirmation, it shall be competent for the Council to erase the name or names of any of the proposed Examiners from the list, and having confirmed the remainder and appointed them to be the Board of Examiners for the ensuing year, to require them to proceed to nominate other fit persons to supply the vacancies in the Board of Examiners.

Whenever a vacancy shall from time to time occur in the Board of Examiners, it shall be competent for the Board duly summoned to proceed to nominate in the manner before described a person to fill the said vacancy. And on his selection being confirmed by the Council, he shall be admitted a member of the Board.

Should the Council at any time, on the representation of the Board of Examiners, think proper to increase the number of Examiners, the election shall take place in the manner before described.

The Board of Examiners shall elect a chairman on the third Wednesday in November. He shall be elected by ballot. The chairman of the Board of Examiners shall *ex officio* be entitled to be present at all meetings of the Council, and shall be duly summoned thereto.

The Board of Examiners shall not vacate office with the Council, Officers, and Committees annually in June, but shall continue to hold office until the appointment of the succeeding Board in November.

It was also resolved unanimously, that the word "collector"* be struck out entirely in the existing Bye-laws.

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* The object of this alteration is simply to substitute the shorter title of "Financial Officer," for the title "Financial Officer and Collector," the duties of the officer remaining precisely the same as hitherto.

THE SOCIETY'S EXAMINATIONS AND COMMERCIAL SCHOOLS.

——— Commercial School, Feb. 19, 1857.

Sir,—Several of my boys are preparing to go up to your examinations in June. As the Society of Arts Examinations are to take place in the beginning of June, which is just the middle of our quarter, I am wishful to know whether there would be any objection on the part of your Society to a young man, who should have passed your examination, coming back for the residue of his quarter, or longer if he felt so disposed. I think this would be important, as it would afford a youth an opportunity to try again and work harder. Hoping you will excuse this trouble.

I am, Sir, yours, &c.,

* * * *

The Secretary of the Society of Arts, Adelphi, London.

(REPLY.)

Society of Arts Adelphi, London, Feb. 23, 1857.

Sir,—I am directed by the Council of this Society to state, for your information, in reply to your communication of the 19th inst., that the Society of Arts did not institute its examinations to ascertain the progress that schoolboys were making, but to test the final result of a School Education, in any given case that might come before their examiners. The Council will, therefore, in every case, rigidly enforce the rule "That no person intending to return to school shall be eligible for examination." The examinations are intended to test the acquirements of young men when entering on the duties and undertaking the responsibilities of life, not to classify schoolboys.

I am, Sir, yours, &c.,

P. LE NEVE FOSTER, Secretary.

To ———

Head Master of ———

EXAMINATION PRIZE FUND.

The following donation has been received since the last announcement:—

J. Harvey Lewis, Esq., £10 10s.

CONVERSAZIONE.

The first Conversazione of the present Session was held on Saturday evening last, when the attendance was unusually large. All the rooms were thrown open, and contained a fine collection of objects of interest.

In the lower rooms were arranged numerous specimens of Art-manufactures in enamel, gem work, gold and silver plate, bronzes, electro deposits, stained glass, fictile wares, tapestry, &c.

The following were the principal contributors, to whom the thanks of the Society are especially due:—

Mr. Joseph Angell, of the Strand.

Large group, in silver, of Sir Roger de Coverley and the Gipsies, from the *Spectator*. An original design; modelled by Henning. Weighs about 340 ounces.

An enamelled tea and coffee equipage, comprising coffee pot, tea pot, cream ewer, and sugar basin, silver gilt, and displaying in contrast the bright silver in line engraving, ornamented with medallions of purple and green enamel. The first specimen ever manufactured. (Mr. Angell claims the first introduction of enamel into articles of this description.)

A chased tea and coffee equipage, in frosted silver, relieved with turquoise enamel, a very delicate and elegant contrast.

A large silver chalice, "repoussé" work, twenty-four inches high, richly gilt and embellished with medallions in enamel of the sapphire, emerald, turquoise, and amethyst colour: original design.

Silver and silver-gilt tankards, inlaid with enamel, an elegant specimen of silver-gilt and enamelled sacramental plate; also equestrian figures in silver gilt.

Messrs. Chamberlain and Co., of New Bond-street.

Figure—"Lady Macbeth," porcelain, in imitation of ivory and oxidised silver.

Vase and cover—"Triumph of Galatea."

Vase—Blue Raffaellesque, richly gilt.

Vase—Painted, "The Seasons," and richly gilt.

Vase—Dark blue, with gilt snake handles.

Vase and cover—Dark blue and gilt, with flowers.

Vase and cover, oval—Turquoise with painted cupids.

Vase and cover, oval—Turquoise with painted cupids, Sèvres shape.

Harewood bottles and covers—Dark blue and gold, with turquoise stones.

Clodion vases—Parian, gilt.

Candlesticks—Porcelain, in imitation of ivory and oxidised silver.

Limoges enamelled vase—Dark blue.

Limoges enamelled tazza and cover—Dark blue.

Limoges enamelled Patera—Dark blue.

Tea-cup and saucer, egg-shell ware—Parian, decorated with grass and butterflies.

Tea-cup and saucer, Jenny Lind ware—Pierced Parian, gilt, and decorated with ivy.

Jenny Lind bottles with stoppers.

Jenny Lind milk jug.

Triumphora—Various patterns.

Parian ewers—gilt.

Jenny Lind cups and saucers—Painted.

Tazzas—Dark blue, painted with roses and gilt.

Small square trays—Sèvres shape.

Inkstand—Painted with flowers.

Cabinet cups and saucers—Various patterns.

Parian figures—"Rebecca and Ruth."

Parian group—"Boy and Goats."

Parian group—"Boy and Dolphin."

Large and small garden-pots and stands—Majolica.

Queen's vase, chocolate ground—Majolica.

Marine vase, blue, &c.—Majolica.

Parian flower vases with glass linings.

Parian jug—Blue stars and gilt.

Dessert service—White and gold, pierced.

Dinner plates—Blue and richly gilt.

A fine service of cut glass.

Messrs. W. P. Copeland, of New Bond-street.

Groups of "David and Goliath," "Burns and Mary," "Golden Age," and "Rebecca at the Well," in statuary porcelain.

Two Verulam bottles, statuary porcelain, painted with heaths and gold cord.

Two vases, statuary porcelain, jewelled and gilt.

Large and small two-handled renaissance vases, coloured and gilt.

Coral centre piece.

Six dessert plates, China, painted and gilt.

Armada bottle, China, blue ground, jewelled and gilt.

Two-handled Pompeian vases, China, painted with flowers and gilt.

Two plain-shaped vases, China, painted with flowers and gilt.

Cord-handle bottle, China, blue ground, jewelled and gilt.

Three Victoria covered vases, Rose du Barry grounds, painted.

One Victoria covered vase, blue grounds, flowers and gilt.

Two Sutherland vases, pink ground, painted with flowers and gilt.

Tile, China, green ground, painted and gilt, mounted in gilt frame.

Messrs. Daniell, of Bond-street.

Vases and plateaux in Limoges ware, a pair of vases and ice-pails, Rose-Dubarry; pierced baskets, Dresden ware; vases with cupids and scroll, card tray, flower-pots in Majolica, &c.

Messrs. Elkington and Co., Regent-street.

Flower-stand, designed by Mr. L. Gruner, a cornucopia, terminated with ram's head, gilt, and relieved by oxidised silver.

Flower-stand, gilt and oxidised, designed by the late Mons. E. Jeannest.

Flower-stand, open work, with statuette of a gardener in centre, designed by Jeannest.

Large-size ivy vase, for flowers, from the original in the Royal Gallery at Naples.

Flower vase, designed by Mr. C. Grant. Subject of the reliefs from the story of Galatea.

Tazza, with group of boys for the pillar, designed by Jeannest.

Tripod tazza, the feet terminated with ram's heads, the top being from a reduction of the shield with the Battle of the Amazons.

Tazza, from one in the possession of J. Auldjo, Esq., F.R.S. The original found near Calvi.

Casket—A cradle with guardian angel, designed by Jeannest.

Casket, enriched with reliefs and enamels, by Jeannest.

Casket, with subjects (in chasing) from the history of Maximilian, Emperor of Germany.

Inkstand, with bas-reliefs, "The Seasons," designed by G. Stanton.

Inkstand, composed from a foot-lamp found at Herculaneum.

Tankard, in oxidised silver, relieved by gilding, from an ivory one in the possession of Henry C. G. Bedford, Esq.

Jug, enriched with figures of cupids, in bold relief, designed by Jeannest.

Sideboard dish, designed by C. Grant, from Homer's Iliad.

Shield, copied for the schools of design, from the original in the Royal Armoury at Windsor Castle, which was presented by Francis I. of France to Henry VIII. The work attributed to Cellini.

Shield, copied from one in the Tower of London. Subject—The Conversion of St. Paul.

Helmet, copied from one in the Tower of London.

Medallion, in commemoration of the achievements of the late Duke of Wellington, designed by Jeannest.

The Earl of Leicester and page, attending Queen Elizabeth, being a reduced copy of the group exhibited in Hyde-park, 1851.

Charles I. discovering his Standard Bearer, on the field at Edge-hill.

Queen Henrietta Maria, meeting Prince Rupert on the way to Edge-hill. The above three groups are from portions of the history of Warwickshire; and the full-sized groups were made expressly for the Warwick races, for which several other pieces have been produced by this firm, from models by Jeannest.

Pair of Candelabra, with figures in German military costume, by Jeannest.

The foregoing series of specimens are enriched with oxidised silver relieved with gold.

Mr. David Falcke, of 92, New Bond-street.

Large antique silver salver. Subject: Esther and Ahashuerus.

Large Italian silver tankard.

Crystal and silver gilt tankard, chased.

Silver-gilt ewer—Louis XVI.

Large silver and parcel-gilt tankard (16th century), engraved with arms.

Large chalice and cover, 24 inches high.

Domestic articles in silver, formerly used as drinking vessels:—Silver gilt ox, silver bear with a ragged staff, silver lion and peacock, silver-gilt huntsman, silver gilt horse, silver cock (parcel-gilt), silver-gilt stag, and silver-gilt owl.

Fine carved cocoa-nut cup, mounted and chased.

Two boxwood figures, mounted in silver-gilt; inscriptions round the top, "Thomas Weilant, Jacob Harmsturffer, Hans Hoffer. Anno Domini 1629," and the initials "A. L." at the back of each of them.

Boxwood figure, mounted as a drinking cup, with numerous badges and arms. A.D. 1679.

Silver tankard, engraved with figures. 16th century.

Early Gothic cup and cover, of great beauty.

Fine old Italian salt-cellar, foot supported by monsters, dragons, and dolphins, surmounted by a figure of Neptune.

Nautilus shells of Italian and German art.

An extraordinary ivory cup and cover, by François Flamands, "Feast of Bacchus." Originally from Colonel Sykes' collection, then from that of the late Colonel Sibthorpe.

Two fine silver salt-cellars. (Period of the Renaissance).

Gothic wine cup on three feet, engraved all over with arabesque and masks, enamelled in various colours.

Chef, very rare and curious, of Byzantine art, studded with gems. Date 1300.

Fine copy of one of the original Portland vases, by Wedgwood, in good preservation.

A collection of rare eastern arms, consisting of guns, dirks, shields, swords, and pistols, elaborately chased in silver, and richly inlaid with gold.

Several vases in Chinese enamel, bottles, &c.

Mr. G. Franchi, of Myddleton-street.

Several electro-deposits from original shields in the Musée d'Artillerie, at Paris. Subjects: "The Head of Pompey brought to Cæsar," "The Laocoon, &c., &c.

A similar specimen from the Louvre. Subject: "Siege of Algiers, by Charles V."

Electro-deposit of small target, from the collection of the Count de Nieuwerkerke, at Paris.

Electro-deposit of shield in the same collection. Subject: "Judith with the Head of Holofernes," and "Decapitation of John the Baptist."

Electro-deposit of leaden plates by Briot, from Marlborough-house. Subjects: "The Prodigal Son," &c.

Electro-deposits from ancient ivories in the British Museum and the Louvre.

Electro-deposit from an original marble, by Jean Goujon. Subject: "Portrait of the Sculptor's Daughter."

Casts in fictile ivory. Subjects: "The Crucifixion and the Baptism of Christ," "Christ Crowned with Thorns," &c.

A series of specimens in fictile ivory, with copper bronzed surfaces.

Messrs. Hunt and Roskell.

An Etruscan cup and cover, an Etruscan wine cooler, the Portland vase, an ice-pail with ruby glass lining, Mazeppa group, Peter the Great (Ascot cup), a Silenus tankard, and a figure of Victory, all in silver.

Messrs. Jackson and Graham, of Oxford-street.

A specimen of old tapestry. Subject—Esther.

Messrs Jennens and Bettridge, of London and Birmingham.

A very beautiful vase, produced by a patented process called, "gem enamelling." A pair of similar vases designed by Gruner, were manufactured for H.R.H. Prince Albert.

Messrs. Lambert and Rawlings, Coventry-street.

Two finely-chased gilt Tazze, Italian manufacture, "Moses striking the Rock," "Christ and the Woman of Samaria at Jacob's Well."

Fine Cup and Cover 12 inches high, composed of Coins. Obverse, Portraits. Legend, "Christian John, George and Augustus." Reverse, "Frat: et duces, Saxon:" 1594, mint marked HB. Bottom of the Cup, a Coin, obverse a savage. Legend, "Deo and Patria," Anno 1619. Reverse, "Anne of Brunswick and Lunneburg." Legend, "Fredric: Ulri dux Brunswic et Lunnebur." Cover, a Coin, obverse two savages holding two boughs. Legend, "Ut frontibus ita frondibus coniunctissimi." Reverse, "Arms of Brunswic and Lunneburg." Legend, "D. G. Rud: Aug. et Anth: Ulr: D.D. Bret Lu. Date 1685," surmounted by a figure of a savage, holding a bag and ingot.

Fine silver-gilt Hanap, supported by a figure standing on one leg.

Fine ivory Tankard, (reputed) by Fiamingo, "Boys assisting at a Vintage."

Magnificent antique alto-relievo chased silver-gilt Tankard, 13 inches high by 6 inches diameter. Subject: Bacchanalian figures dancing.

Antique German Tankard, Nymphs and Satyrs. This fine specimen of work has the cover and foot of filigree work, a ducal coronet and J.W. reversed.

Fine Spanish silver-gilt Chalice, with six old enamels encircled with gems.

Fine Mulberry Hanap. Antique German silver-gilt Tankard, chased.

Fine Italian silver-gilt Chalice. Subjects: From the Parables.

Richly chased silver-gilt German dish, fruit and scroll border and figures in a garden. A ditto to match, "A Supper Party."

Fine German silver-gilt Shield, figures in Alto-relievo, from ancient mythology.

Fine "Couteau de Chasse," Damascus blade. Handle, Stag's head, and antlers on the guard. Two figures, in Ancient Hunting Costume.

Mr. Page, of Whitechapel-road.

Specimens of pellucid chromatic embossed glass.

Messrs. Thomas Pearce and Son, of Ludgate-hill.

Bronze statuette of Spartacus.
Bronze statuette of Andromeda.
Two vases, with covers, after the antique.
Vase with bas-reliefs and olive handles.
Etruscan ewer.
Renaissance ewer.
Vase with relief after Clodion.
Grecian Candelabrum.
Candelabrum (conventional design).
Statuette of "Pandora," after Pradier's original.

In Sèvres porcelain—Etruscan ewer, decorated; Etruscan vase, decorated; low open vase, decorated.

In Parian—Mug, with open work; small vase, decorated with butterflies, &c.; ewer, with flowers in relief.

A series of vases to show the most recent style of decoration.

Triple flower stand—Bisque.
Ewer—Bisque.
Partridge in relief—Bisque.
Painting on China after Rubens.
Group in Parian—"The Angel's Mission."
Moderator lamps with figures in bronze.

Messrs. James Powell and Sons of Whitefriars.

Painted and stained glass, and patent embossed stained glass. Also, a series of specimens illustrative of the manufacture of articles of utility in plain, cut, engraved, moulded and coloured glass. The glasses after Venetian patterns, were good illustrations of the capabilities of our manufacturers to reproduce this class of works.

Mr. Samuel L. Pratt, of Bond-street.

A specimen of Tapestry of the 15th century.—Figures of Saints and a Bishop under canopies.

Two ovals of Italian Tapestry, of the period of Henry 8th.—"David slaying Goliah;" "David taking the spear &c., from the tent of Saul."

Five pieces of the period of Elizabeth, representing the "Parable of the Prodigal Son."

Eight pieces of Flemish Tapestry, dated 1725:—"The Adoration of the Magi;" "The Ascension;" "The Assumption of the Virgin;" "The Conversion of St. Paul;" "Christ Giving the Keys to St. Peter;" "Christ allaying the Tempest;" "Peter Walking on the Sea."

Two specimens of Gobelins Tapestry—Flowers and Arabesques, of the period of Louis XVI.

Several large pieces of tapestry of various periods, which entirely covered the walls of the room.

Messrs. Watherston and Brogden, of Henrietta-street, Covent-garden,

Exhibited their gold, enamelled, and jewelled vase, which obtained a prize medal in 1851, and a first-class medal in Paris, 1855. It is the largest piece of gold plate ever manufactured in this country, and is valued at 2000 guineas.

Copies of Etruscan, Pompeian, and Roman ornaments of jewellery, the originals being in the British Museum, the Louvre, and the Marquis Campana's collection, at Rome. There is great difficulty in attaining perfection in this class of work, the soldering filigree wire upon solid gold mounts being a far more delicate operation than when altogether filigree.

Messrs. Widdowson and Veale, of the Strand.

A flagon in frosted silver, repoussé work, with four compartments, illustrating the Life of Christ.

In the suite of rooms on the first-floor, were exhibited a fine collection of water-colour drawings, by Turner, J. D. Harding, Cattermole, Corbould, Stanfield, Danby, Warren, De Wint, Cox, and other eminent artists, as well as photographs, of unusual size, by Bisson *freres*, Baldus, and other distinguished French photographers. On the tables were displayed several sets of philosophical apparatus, optical instruments, &c.

The Crystal Palace Company lent from their picture gallery:—

Several fine water-colour drawings, and a series of the most recent and finest French photographs in their collection.

From the Literary Department, the following rare and splendid books:—

The King of Prussia's Testament, of which only four copies exist in England.
The Dresden Gallery, Vol. I.
Dickenson's pictures of the Exhibition of 1851.
Progress of the Sydenham Palace, two vols, (photographs).
Illuminated Books of the Middle Ages.
Etchings, by John Clerk, of Eldin.

The following gentlemen contributed water-colour drawings:—

H. Burton, Esq.; J. D. Harding, Esq.; John Henderson, Esq.; J. A. Rose, Esq.; Clarkson Stanfield, Esq., R.A.; George Stanfield, Esq.; Thomas Thorby, Esq.

Miss S. Durant contributed a fine bust in marble, by herself, of Mrs. Beecher Stowe.

Mr. W. Essex exhibited three enamels, painted by himself.

Mr. Louch—Three enamels, painted by Mr. W. Essex.

Mr. B. Waterhouse Hawkins—Models of the restored animals in the Crystal Palace.

Mr. Chief Justice Temple—25 Indian antiquities from British Honduras.

Messrs. Bland and Long exhibited stereoscopes and stereoscopic pictures.

Messrs. Elliott and Co., of Charing-cross, exhibited a set of philosophical apparatus for educational purposes, as approved by the Committee of Council for Education. Also Professor Willis's apparatus for teaching mechanics.

Messrs. Horne and Thornthwaite, of Newgate-street, a similar set of apparatus.

Messrs. Knight and Co., of Foster-lane, some improved stereoscopes.

Mr. Ladd, of Chancery-lane, some microscopes and microscopic objects.

Mr. Mayall, of Regent-street, stereoscopes and specimens of his patent artificial ivory photographs.

Mr. Williams, of Regent-street, some photographic portraits.

The only hindrance to a full examination of the numerous objects collected for the entertainment of the company, was the over-crowded state of the rooms. Several applications have been made by members, since the Conversazione, for an opportunity of studying the collections, but owing to the necessity of re-arranging the room for the Society's meetings, it has been impossible to comply with the requests made. This is, however, much regretted, and leads the Council to hope that the members will be induced to join with them in making a speedy and vigorous effort to obtain for the Society that enlarged accommodation which its constantly increasing numbers and the importance of its objects render so imperatively necessary.

TWELFTH ORDINARY MEETING.

Wednesday, Feb. 25, 1857.

The Twelfth Ordinary Meeting of the One Hundred and Third Session was held on Wednesday, the 25th inst., Colonel Sykes, F.R.S., Chairman of the Council, in the chair.

The following Candidates were balloted for, and duly elected members of the Society:—

Courtauld, Samuel.
Eyton, Price Ellis.
Foster, John Porter.
Key, Kingsmill Grove.
Myers, George.
Stopford, James Sydney.
Tagg, William.
Vigers, Edward, jun.

Previous to the reading of the paper, the Secretary called the attention of the meeting to three samples of raw sugar, the growth of the colony of Natal, brought before the Society by Mr. Thomas Hilton, who describes them of "very strong quality," and adds—

"The average cost of production of the samples shown is, at the outside, 11s. per cwt., and the market value of sample No. 1 is 40s. per cwt., in bond in London, or from 53s. to 54s. per cwt., duty paid. This important difference of value, coupled with the decreasing supply of sugars from other places to this market, has induced me to bring this matter before the Society. At the present time the sugar is grown only upon a small scale, but I can refer you to very high authority for the fact, that there is abundance of land in the colony, adapted for the growth of it, that can be bought from £1 per acre. It only wants capital and enterprise to make Natal a large sugar-growing colony."

The Paper read was:—

ON THE FACTORY OR HALF-TIME SYSTEM OF EDUCATION, AND ITS GENERAL APPLICATION.

By Alexander Redgrave (one of H.M. Inspectors of Factories).

It would be altogether superfluous, in this room, and before this audience, if I were to occupy even a moment in urging the necessity of the extension of education. That there does exist a want of education among the children of the labouring classes, is now almost universally acknowledged; the chief point of discussion is, the means whereby this want should be supplied. Among the plans which have been proposed for ensuring the education of the children of the labouring classes, the factory or half-time system holds perhaps, at this moment, the most prominent place. Many of those who do not recommend the adoption of the half-time system in its integrity, advocate a system which shall make attendance at school indispensable, under obligations, either pecuniary or moral. It has appeared, therefore, that an investigation of the only compulsory system of education in this country,—the factory or half-time system, a knowledge of its actual condition and of its results, would be most useful at the present moment, and I propose to submit to the consideration of the members of this Society, some of whom I believe advocate an extension of the half-time system, and all of whom are earnest promoters of education in all its phases, such facts as I have been able to collect in the execution of my office, showing the working of the half-time system, and, having done that, to offer some observations upon an extension of a compulsory system.

In examining the present condition of the half-time system of education, it will be necessary to inquire into its effects upon the employment of juvenile labour, upon the operations of trade, its results as a system for the education of the young, the educational position of the half-time scholar compared with its whole day contemporary; and, having fairly investigated these points, to inquire whether the system is, at the present moment, the best that could be adopted.

Prior to the year 1833, children employed in the factories received, as a class, no instruction whatever. There was no limitation of the age at which they might be admitted to work, there was no restriction upon their hours of work. Some manufacturers indeed had, prior to that date, established schools and required the attendance therein of the children employed by them; but, when the hours of work of children, of women, and of men, were alike unrestricted by custom as by law, no great educational advantages could be gained even in these factories. The surprise is, rather that any manufacturer should, in the days of unrestricted labour, have been willing to face the competition of the trade, voluntarily to surrender his position of equality, by placing any restriction which might influence disadvantageously the operations of his factory, even in a slight degree. The conduct of these gentlemen deserves the highest praise, and in speaking of the factory system, as it now exists, we must not forget that these were the pioneers to clear the way for the very salutary regulations which, for the last 20 years, have conferred many and great benefits upon the factory operatives.

It will be unnecessary to describe more of the provisions of the factory acts than as bearing upon juvenile labour. The half-time system is applicable only in establishments wherein steam, water, or other mechanical power, is used to propel machinery for the preparing, manufacturing, or finishing of any articles made of cotton, wool, worsted, silk, flax, hemp, or hair. Bleachworks, dyehouses, printworks, hat and lace factories, are exempted. Thus, factories for the spinning of cotton by steam-power, for the weaving of calico by water-power, for the finishing of woollen cloth by steam-power—are factories within the scope of the Factory Acts. But factories wherein silk, velvet, woollen goods are woven by hand, are not within the purview of the statutes.

In the factories in which power is employed the following are the regulations as to labour:—

The labour of men above 18 is unrestricted.

The labour of females above 13, and of males between 13 and 18, is thus restricted:—

The hours of work must be taken between six a.m. and six p.m., with 1½ hours out for meals, on the first five days of the week, and between six a.m. and two p.m., with half-an-hour out for meals on Saturdays, *i.e.*, 10½ hours on five days, and 7½ hours on Saturday = 60 hours per week.

The labour of children under 8 is interdicted. Children between 8 and 13 may only be employed either between 6 a.m. and 1 p.m., or between 12 at noon and 6 p.m.; they cannot be employed more than 6½ hours on any one day.

This is the class to which the half-time system applies, as half the day is spent in factory, the other part must be spent in school. Every child between 8 and 13 must attend school daily for three hours on five days in every week, between 8 a.m. and 6 p.m. The occupier of the factory is liable to penalties for employing a child the week following the omission of even one attendance at school, and for not having certificates signed by the school-master of every day's attendance at school of every child employed by him. The parent is also obliged, under penalty, to cause his child to attend school.

The half-time system of education consists of—

Daily attendance at school combined with half-time employment:

Daily responsibility of the employer and of the parent for the regularity of the school attendance for each child.

There is a compulsory system of instruction under a distinct act applicable to printworks, but it is of so doubtful a value, being merely the requirement of attendance at school for 150 hours in every six months, either continuously or at intervals, at the option of the child or its parents, and is carried out in so few establishments, that I need not notice it further in this place.

Such being the requirements of the law for preventing the excessive labour of children in factories, and for securing to them some opportunities of instruction, it is necessary to see what the effect of this direct application of the system has been, both with respect to the arrangement of labour in factories, and upon the employment, and consequent extension of education, of the children.

The half-time system supposes the employment of two children working half the day, to perform the labour of one child working all day; and, however surprising it may appear, yet it is a fact, that the immediate effect of the application of the half-time system, was to exclude from factory labour, and consequently from the intended advantages of education, one-half of the children employed for full time, and this will be best shown by reference to certain Parliamentary Returns which are discussed in the Joint Report of my colleagues and myself recently laid before Parliament.*

It appears that, in 1835, there were employed, in 2,929 cotton, wool, worsted, and flax factories, 47,373 children between 9 and 13 years of age; but as the Factory Act was then only in partial operation, but 17,147 of these children were then attending school, the remainder being employed for full time. Silk factories have been excluded from these comparisons because they were practically exempt from the restrictions of the Factory Act until 1844, and since that date they still have peculiar exemptions not awarded to other factories.

In 1838, the factory system was in full operation, and all the children between 9 and 13 years of age attended school, and were brought under the half-time system, rendering apparently necessary the employment of a greater number of children than were employed under a full-time system. In this year, returns were received from 3,949 factories employing 24,831 children, *i.e.*, a third more factories employed one-half the number of children—the number that ought to have been employed was between 70,000 and 80,000.

Another return was obtained in 1850. At this period it was lawful to employ children at 8 years of age, instead of at 9, which was the earliest age of children in the previous returns. In this year, 4,323 factories employed 33,624 children, a larger number than in 1838, but a smaller increase than the increase of other classes of hands.

The last return is for 1856, and it shows a considerable increase of the number of children in cotton factories, but still the number of children between 8 and 13 years of age, now employed for half-time in 4,657 factories, is less than the number of children, between 9 and 13 years of age, employed in 2,929 factories in 1835; or, comparing 1856 and 1835 (and making every allowance, in the comparison, for the various kinds of factories and of processes brought within the Factory Acts since 1835, such as weaving by power, &c., in which chiefly adults and young persons are employed), if the labour of the children working full time in 1835, were performed in factories in 1856, by children working half time, for which double the number would be required, instead only of the 44,385 children now attending school, there would be at least 120,000.

Silk factories have been excluded from the above statement, for the reasons I have explained; but if a comparison be made of them, similar and perhaps more striking results will follow.

In 1844, silk-throwing factories were exempted from the half-time system, and in that year the silk-throwing mills in the town of Derby gave employment to the following number of hands:—

Above 13 years of age	3265
Between 11 and 13 years of age	633
Between 8 and 11 years of age	431

all working full time, and none attending school.

In 1845, the youngest class, those between 8 and 11 years of age, were required to work half-time and to attend school:—the numbers were

Above 13 years of age	3466
Between 11 and 13 years of age	625
Between 8 and 11 years of age	128

The labour of the 431 children employed for full time in 1844, was not provided for in 1845 by the employment of double the number working half-time, for only 128 half-timers, less than one third, were then employed; nor was this deficiency caused by the introduction of new machinery. In 1850, the number of half-timers was reduced to 12, and although they had increased to 93 in 1856, the remainder of a large increase was confined to the oldest hands.

That these results were the direct effect of the application of the half-time system, cannot be doubted. The trouble of arranging relays or sets of children, the necessity of employing twice the number for the same work, and the difficulties with respect to wages, were serious impediments to a cheerful acceptance of the system; and when to these is superadded the responsibility attaching to the employer so long as he has one child upon his premises, the constant necessity of supervision over the school attendance of the children—a supervision over them not in the factory, but beyond its limits, and frequently almost beyond the reach of his control, it is not unnatural that the employment of half-timers has so much diminished; in fact they are rarely now employed unless the supply of older hands is limited, or the nature of the work is held to require smaller hands. If the effect of the half-time system had been to cause the attendance at school of the children whom its provisions banished from the factory, we should not regret that the labour of children in factories has been so much diminished; but the knowledge that such a vast number of children have been deprived of the educational benefits intended for them, is a matter of the deepest concern to all. An intelligent manufacturer of Glasgow, in a letter addressed to Lord John Russell, laments that in that city, containing 400,000 inhabitants, only 140 half-time children are attending school; and he thus describes the present condition of the children destined to become factory operatives when old enough:—

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* Reports of the Inspectors of Factories for the half-year ending October 31st, 1856.

"Twenty years' trial has left the factory population as uneducated as ever, and the children now, instead of the healthful discipline of the factory and the schools, are degraded to ragged idleness and stolid ignorance. Instead of giving them moderate labour with the addition of healthful teaching, children have been robbed of all employment, and turned over helpless and unprovided for to the tender teaching of the streets."

My colleague, Sir John Kincaid, who is Inspector of Prisons as well as Inspector of Factories for Scotland, and who may therefore speak with authority upon the uneducated classes, thus refers in his report for April last, to the educational condition of the factory population in Scotland:—

"As the question of education is at the present time attracting much attention, both in and out of Parliament, it may not be inopportune if I revert to some observations on that subject which I made in previous reports, arising out of inquiries which you directed me to make in regard to the employment of children in the houses of their parents. These observations will be seen by referring to my report of April 1850, p. 34; October 1850, p. 42; and in that for October 1852, p. 46.

"The educational condition of the children of the poorer classes in Scotland is in no respect improved since I then wrote; I still go into factories, and selecting at random the names of five or six children to be brought before me for examination, it is not unusual to find that only one or sometimes two of the number can either read or write.

"This lamentable state of ignorance is not caused by the want of schools, for there are, I believe, few districts in Scotland in which the children of the poor may not receive education at a mere nominal charge; but poverty and profligacy are alike instrumental in inducing parents, instead of sending their children to school, rather to send them prowling the streets, on the chance of picking up a few pence, honestly or dishonestly, as the case may be, to feed the wants or the vices of the parents.

"Such is the condition of a great number of the children of the poor in the manufacturing districts of Scotland, until they have arrived at the age of 13, when they become eligible for employment in the factories as 'young persons;' for, as I formerly showed, the educational clauses of the Factory Act, contrary to the benevolent intentions of its framers, have virtually excluded children under 13 years of age from employment in the Scotch factories, so that the class I have adverted to, having received no education prior to their entering the factories, have little chance of receiving any after, their weekly earnings being absorbed in the wants of their parents.

This is an enormous social evil, which, it appears to me, may be corrected by giving the parent a direct interest in the education of his child, by establishing an educational test as a qualification for employment."

The main object of parents is unfortunately to enjoy at the earliest possible period, full-time wages instead of half-time wages, and all kinds of artifices are employed to entitle a child to work full time. To obtain this it is necessary that the child should be certified by a surgeon to be in his opinion 13 years of age, and forgery and falsification of documents are not unfrequently employed for obtaining that expression of opinion. A very painful case was recently brought to my notice, in which a certificate of baptism had been altered so as to prove a child not really 12 to be 13. The surgeon had refused to give a full-time certificate to a boy in his opinion under 12; the boy afterwards produced a certificate of baptism proving his age to be 13, but upon examining the document carefully, the surgeon found that the year of the birth had been altered. He forwarded it to me, and from the investigation which was made with the view of punishing the person who had altered the certificate, it appeared that the boy was an orphan, that he could read and write well, and that he lived with an aunt, who had refused to keep him any longer unless he obtained work for full time. Not being able to do so, he himself altered the certificate and presented it to the surgeon.

Independently of the direct interference with labour of the half-time system, improvements in machinery, which meet us in every kind of factory, are nearly all substitutes for manual labour; the fewer the hands in a factory, the more easily, the more economically, can its operations be conducted, and the younger hands are those whose labour is most frequently dispensed with. I have been assured in woollen factories that the "Piecing Machine," the only operation of which is to join or splice the rollers of wool, usually performed by school children, has been adopted expressly to avoid the employment of them. The use of this machine and the condenser, also dispensing with juvenile labour, is extending very rapidly, thus throwing many out of work who were physically capable of performing it, and depriving them of certain educational advantages which they could not possess as full timers.

Such having been the effect of the half-time system upon the number of children employed in factories, it is desirable, in the next place, to consider what has been obtained by half-time attendance at school.

In the minds of many parents, and I am bound also to add of too many factory occupiers, it is considered sufficient if the schoolmaster's certificate attest the attendance of a child at school, merely so as to satisfy the law. Be the schoolmaster who he may, provided he testify to the daily three hours' atttendance at school, they are satisfied—thus the law teaches them. The law requires the child to be *in* school from 9 to 12, or from 2 to 5; that therefore is all that is deemed necessary; the quality of the school is no part of the compact. The parents select the school (and the right to do so is properly theirs,) but having done what the law requires, are they really so much to blame? My colleague Mr. Howell, in his last report, pp. 54, 55, refers to this subject in the following terms:—

"The parents of the factory children, in complying with those provisions of the Factory Act which enjoin daily attendance at some school, are from poverty necessarily guided in their selection of the school rather by its cheapness than by its merits, in order that as small a sum as possible may be withdrawn from the child's weekly contribution to the common stock for the maintenance of the family. And where, as in the Factory Act, he certificate is so ill contrived for the attainment of its professed object—the furtherance of education—as merely to attest the barren fact that a certain number of hours have been spent in a schoolroom, without any guarantee that something useful has been learned, or that some definite progress has been made in gaining useful knowledge, it is of paramount importance that good schools should be provided, and made accessible at as cheap a rate as any others into which children of the poorest people are admitted; otherwise the parents will always choose the cheap private day or dame's schools in preference to those educational establishments where really useful instruction is to be obtained, but at a higher price.

The remedy for this defect would seem to be to enable public day schools, by a sufficient endowment, to give better instruction at as cheap a rate as that at which these dames and private schools are opened to factory children, or to require in every case a certificate of proficiency from time to time as a test of something having been learnt, instead of a mere certificate of so many hours having been spent in a schoolroom."

The attendance at school, when observed, is only for half-time; while the regular hours of the school are six per day, and an energetic and intelligent master has an arduous task to make those six hours comprise all that he could wish, what small chance has the half-day scholar of reaping real advantages from the confined opportunities of a half-time system. In the case of girls, for instance, attending school three hours per day, they must be taught to knit, sew, and to mend clothes; one hour, frequently one hour and a-half, is devoted each day to instruction in the use of the needle; the remaining hour and a-half or two hours to general instruction; what can they learn in that time? how much of the teacher's time can be bestowed upon each individual? Again, it is most important to remember, that to the ordinary day scholar his school is his only occupation; to the factory child it is a part only of his occupation, and secondary to his employment.

The school attendance, moreover, is not continuous; it depends upon the regular employment of the child. If the child does not work for a week, it does not go to school; and in general the child destined for factory labour does not go to school until compelled by its entrance into a factory. If the school attendance endured from the age of 8 years until 13, when school attendance is no longer obligatory, the results of a half-time system would be doubtless satisfactory, but it will be necessary to ascertain the duration of attendance at school, and the real value of that attendance as exhibited in the progress of the children.

The very short time during which the children of the labouring classes remain at school is the greatest existing impediment to be removed; it clogs the best efforts of the school teacher; it retards the progress of the child, and produces failure where we in vain seek success, and its real proportions cannot be too widely known.

The reports of the Inspectors of Schools enable us to appreciate this question as its importance deserves. In them will be found most valuable statements, showing the ages and attainments of school children, and the length of their stay in school. The proportions of the latter vary in different localities; but in Lancashire and Yorkshire it appears that about one half of the children (46 per cent.) leave school before the expiration of one year.

In my report for April, 1853, I gave the results of some inquiries into this subject among the schools of my district, at which factory children attend. The number of schools is about 310. Of these I rejected 126, viz:—those which were of a marked inferior character, and those which were attended by so few factory children as to afford no comparison, and I obtained from 184, being National-schools, Church, British and Foreign, Dissenting and Factory-schools, being the best in my district, returns shewing the duration of attendance, and the attainments of the children.

The number of children then attending these schools, (April, 1853) amounted to 14,705 half-timers employed in factories, and 15,125 children not employed in factories attending school the whole day.*

The duration of attendance in these schools is very similar to the results obtained by the Inspectors of Schools, and, comparing the two classes of scholars, appeared to be as follows:

In School.	Factory children.	Whole day Scholars.
	Per cent.	Per cent.
Under 6 months	37.4	33.5
1 year and above 6 months	24.2	23.9
2 years and above 1 year	14.6	16.5
Above 2 years	23.8	26.1

This is a somewhat important statement, because it is evident that the factory half-time system has not had the effect of prolonging the duration of school attendance.

In the same report I gave the best results I could obtain as to the attainments of the factory half-time children then attending school, as compared with their fellow scholars, attending school all day; and I procured statements of the actual occupation of the children in school, of which the following is an analysis:—

	Factory children.	Whole day children.
	Per cent.	Per cent.
Learning to read only	10.7	26.5
Learning to read and write only	21.3	20.9
Learning to read and write, and the first four rules of simple arithmetic	41.7	25.7
Learning grammar, geography, history, and the higher rules of arithmetic	26.3	26.9

This statement is decidedly favourable to the factory children; but then none of the factory children are under 8 years of age, while the other children are from 4 years and upwards; but if such of the children as are under 8 years of age are excluded, the comparison, from the best data I could obtain, appeared to be as follows:—

	Factory children.	Whole day children.
	Per cent.	Per cent.
Learning to read only	10.7	—
Learning to read and write only	21.3	—
Learning to read and write, and the first four rules of simple arithmetic	41.7	48.9
Learning grammar, &c., and higher rules of arithmetic	26.3	51.1

This statement discloses a discouraging picture of the average attainments of factory half-timers, compared with whole-day children of the same age and in the same schools; both classes remain in school about the same time; but the factory half-timers only spend, at the utmost, half of that time in school.

The value of regular attendance at school is shown in the attainments of the children attending five of the factory schools in my district; *i.e.*, schools attached to factories, supported by the occupiers of the factories for the education of the half-time children employed by them, in which the vacancies in the factory are filled by draughting boys from the school. The attainments of the children, who have thus attended school all day prior to working in the factory, are as follows:—

	Per cent.		Per cent.
Learning to read only	1.2	instead of	10.7
Learning to read and write only	11.0	,,	22.3
Learning to read and write, and the four first rules of simple arithmetic	47.0	,,	41.7
Learning grammar, &c., and higher rules of arithmetic	40.8	,,	26.3

This is, perhaps, what the abstract principle of the half-time system was expected to produce, but having failed to secure regular attendance at school from the age of 8 to 13 years, it has failed in its chief recommendation as a system of education.

But factory legislation, of which the half-time system is a part, has been of the most essential service to the labouring classes. It at once put a stop to the growth of that unnatural system wherein the employment of the wife and mother superseded that of the husband and father; the employment of the child, that of the adult. The adult man, the duration of whose labour is not directly lessened by the factory acts, does, nevertheless, work for shorter hours, as his labour depends upon that of women and children which cannot be protracted. The mother is no longer detained from her home, her children, her domestic duties, after 6 o'clock in the evening; she has ample time for meals, and on Saturday her work ceases at 2 o'clock in the afternoon. Young men and women enjoy similar advantages, and the Institutions in union with this Society can probably bear testimony that the time after 6 o'clock in the evening is well spent.

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* The above number of 14,705 half-time children attending only 181 of the schools in my district, was very little less than one half of the whole number of children employed in the factories of the United Kingdom.

I may mention, as an instance of the value of the relief afforded by the factory acts to this class of workers, the following circumstance which came under my own observation:—

A factory was recently established at a seaport in my district where none had previously existed. At my first visit I found the hands, all of whom, except 3 or 4, were girls and young women, working in one large room, noisy, inattentive, and impudent. They were, in fact, in the words of the manager "a sad lot." But at subsequent visits I found the aspect of the place changed; noise had ceased, they were all attentive to their work, and the manager told me he did not then wish to have a better set of hands, many of whom had been with him from the commencement. In explanation of the change, he told me he had established an evening school 5 nights in the week, and that he and his wife taught all who chose to attend, reading, writing, and accounts, at a charge of one penny per week, the occupier of the factory finding the lighting and firing in the winter months. The attendance varied from 50 to 70 per night, and the excellent manager pointed out to me several women who were ignorant of their letters, but who could now read and write.

Children of tender years have been benefited in a greater degree. Factory legislation has prevented the excessive labour of the child; it can no longer be employed from early morn to dusky eve, hour by hour and side by side with the adult man; its strength is not overtasked, its unset bones are not crippled, nor its constitution diseased by exhaustion and protracted employment. Its labour must be moderate; it must pass some hours daily in school; and, being so obliged to attend school, the school fee is provided for in the wages it earns. Those children who do work in factories have thus been brought to school, who, without these laws would never have entered a school-room.

Two great objects were proposed by the benevolent authors of factory legislation. The physical and the moral improvements of factory hands. Their physical improvement is now well established; sufficient, yet moderate labour has produced its natural results. The present generation of factory hands are free from the diseases and ills which afflicted their predecessors. It is rare to see what are commonly called "factory cripples;" men whose strength in youth from excessive labour was unable to support the fatigue of their employment, whose spines became curved, whose legs gave way beneath the weight of their attenuated frames. Upon inquiring of one whom I recently met in a manufacturing town, to what he attributed his deformity, he replied, "When a boy I was as straight as an arrow, but 15 hours a day in a factory, before you gentlemen came to look after us, made me what I am." The daily labour of that man's child now never can exceed six hours and a half.

The actual effect upon the moral improvement of adults and adolescents could not be so immediate. Their bodies required rest, which was given upon the passing of the statute, but their minds required occupation for which they could only be gradually adapted. Nevertheless, the improvements in social habits, the increasing desire for instruction, and the appreciation among employers of those as servants who distinguish themselves by attainments as well as industry, so happily called into action by the exertions of the Council of this Society, warrant the confident hope that time and opportunity have not been thrown away.

To the moderate hours of labour and necessary attendance at school of children under 13 years of age, may doubtless be traced gradual improvements in character and conduct; from them other benefits have flown and will yet be brought to light. Many children have turned their half-time school attendance to good account; and have taken a respectable position among the whole day scholars. Some have gained pupil teacherships, and and have obtained advancement in consequence of attainments and conduct; and it is most gratifying that factory labour, as at present regulated, does not prevent the industrious and intelligent child from obtaining a reward commensurate with its exertions. But all children have not the like application; all parents have not the like desire to foster the diligence of their children, the same pride in their successful attainment of knowledge. The instances to which I have referred are not the rule of the half-time system, but the exception, proofs of what can be done under an imperfect system. A retrospective view of the half-time system of education must convince every one that it was excellent as a commencement; that it was at its institution a great step in the right direction, and it is at the present time a great boon to a portion, though comparatively a small portion, of the labouring classes. Fully alive to the advantages which flow from it, I cannot, however, satisfy myself that, as an educational scheme, it would be adapted for general and indiscriminate extension.

It is not a system simply for promoting education; it has a double purpose; it is a part of a general scheme for the prevention of the excessive labour of children, young persons, and women. If it be shown that excessive labour prevails in trades not under the Factory Acts, —as, for instance, in lace factories—let the labour of children in those trades be restricted to half-time, and let them be sent to school as if employed in factories, but if no such excessive labour be alleged, and if the sole object proposed be to secure to children of tender years opportunities for instruction, then should the regulations be framed for that specific purpose, not involving other considerations, which will militate against the full and satisfactory development of the enactments.

The authors of factory legislation having in view the twofold object of permitting moderate labour, and of providing for instruction in certain trades, where certain physical evils were caused by excessive labour, necessarily adopted a combination of the two, but if they had been required to propose a scheme of education for universal application, I think it may be reasonably questioned whether they would have recommended exactly the same scheme.

It appears, as far as we are able to judge, that, for some years to come, the labour of children will be indispensable to the employer on account of its cheapness, and it appears no less probable, that the wages of their labour will be indispensable to parents; those who pay and those who receive being both agreed, it is unlikely that their compact will be easily disturbed. We may all desire a golden age, when every child shall remain at school until the age of 14 years, and shall not depart therefrom until some years' training shall have produced a result; the realisation of such a dream is at the present moment impossible, but we may nevertheless attempt that which is practicable, which will interfere as little as possible with the relations of employer and employed, which will offend few prejudices, and which will prepare the way for improvements which the growth of time and the ripening of men's minds will fit them to appreciate and to accept.

If the legislature is to be called upon to place other trades under restrictions—and if other trades why should there be any exception—it is certainly of the gravest importance that the restrictions should be productive of the largest amount of good, that those who are placed under pains and penalties should have the consolation of knowing that a commensurate good follows from the restrictions, and that the restrictions should not be opposed, even in imagination, to the interests of either employer or employed.

To the government of this country belongs the duty of enunciating principles; to the people themselves, under such supervision only as may be absolutely necessary, the duty of carrying those principles into effect. It would be perfectly legitimate for the legislature to enact that every child shall receive instruction, but it would be indefensible if they were to prescribe the schools in which such instruction must be communicated, and the manuals which must be used, and I apprehend that the legislature is actually called upon by all moral and social considerations to see to the instruction of the children of those who will not see to it themselves, upon the same principle upon which the legislature has already interfered in the case of children who, from the neglect of their parents, have lapsed into crime, by requiring such parents to maintain their children during a lengthened reformatory incarceration for the offences to be traced to the neglect of parental duties. The analogous course would appear to be, to deprive parents of their present right to the wages of children of tender years, by declaring that the employment of children under 12 years of age should be illegal, unless they produced an educational certificate.

As the legislature has already provided safeguards against the excessive labour of children in certain employments, wherein their physical development would suffer but for that intervention, it does not appear to be necessary to extend the provisions of the Factory Acts to other employments, unless a reduction of the hours of labour be specially determined upon. There is one class of employment in which the necessity of interference with labour has been clearly established, viz., Lace Factories, where the most disastrous moral results are the effect of unrestricted labour; but having regard now to the question of education generally, I would venture to propose:—

That no child under the age of 12 years should be employed as an apprentice, or for hire, or continuously in any other manner (except children whose school attendance is regulated by the Factory Acts), unless a certificate be produced to the person employing the child, certifying that he has attended school, and that he can read the Bible fluently, can write a fair text-hand, and can work sums in the four first rules of simple arithmetic. That the certificate should be signed by a schoolmaster, whose signature should be attested by a clergyman or magistrate. That no certificate should be valid unless upon an engraved form issued from the Stamp-office, bearing a sixpenny stamp, and sold at the price of the stamp by all persons licensed to sell stamps. That there should be a penalty upon the employer and upon the parent of a child employed without a certificate, and a penalty for forgery or fabrication of certificates.

The principle of requiring instruction to precede employment would, I think, be much less difficult of application, and much less exacting to employers, much less obnoxious to the prejudices of parents, as well as much less opposed to their interests than a half-time system, while it would be, I believe, much more efficient in reality.

The employer would have but one act to perform, to require the production of a certificate, to examine it, and satisfy himself of its trustworthiness, and his responsibility would be at an end. He would not have to employ two hands for one; to re-arrange wages, nor would he be liable to penalties day by day for the omission of children to attend school. No daily vigilance would be necessary to see that the children have attended school, nor weekly examination of certificates.

However much we may lament the indifference which the labouring classes exhibit to the education of their children, and however much we may condemn their prejudices, we cannot ignore the existence of both, nor the difficulty of eradicating them; which, though we may be unable to disperse, it might still perhaps be possible so to regulate, as to make that which is unyielding and rigid, pliant and bending to our will. The labouring man does not as yet appreciate the value of education for his child. He looks to his child earning wages. If education were indispensable to fit children for employment, how many would now be at school, instead of idling in the public thoroughfares.

Under the half-time system the parent does not send his child to school, because he waits until his employment in a factory shall provide for the school fee, and he only sends him to school then because attendance at school is imperative. Here there is an indirect inducement to the parent to keep his children from school, or to prove his child to be of that age when school attendance is no longer obligatory. It is always an object with the parent to obtain the admission of his child to a factory as a full-timer, because he then receives full-time wages instead of half-time wages; thus the parent has no solid advantage in sending his child to school; he does so, because without it he cannot receive the child's weekly pittance. But if it were made to his interest to send his child to school at an early age, to see that his child learnt something at school—if he perceived that the children who had been to school were preferred to those who were ignorant—if the receipt of wages depended upon previous instruction, if full-time wages were always to be obtained—if, in fact, it were made a question of wages, I doubt not that a very different feeling from that which now exists would animate the labouring classes. Under such a system there would be little interference with the supply of labour, or with the rate of wages, although the commencement to labour of some few children might possibly be postponed for a short period; and there being no responsibility constantly hanging over the head of the parent, his prejudices against education would gradually yield to conviction, and while sending his children to school, he would be preparing a future supply of juvenile labourers.

If a parent object *now* to the half-time wages of his child in a factory, he has the option of obtaining for it work elsewhere for full time, where full-time employment has not been shown to be injurious, but if a half-time system were universal, children who might be refused work on account of their being half-timers, or whose parents might object to half-time wages, would be deprived of work, of wages, and of instruction.

The first objection that may be urged against the principle which I have ventured to propose, will be the restriction of the certificate to children under 12 years of age. It will be contended, and with great truth, that previous to that age the merest rudiments are learnt, and that it is after the age of 12 that the real value of instruction is felt, and that all our efforts ought to be directed to retain children at school after that age. To the importance of such an effort I fully subscribe; but in proposing that the legislature should interfere to *compel children* to attend school, care must be taken that compulsion should be exercised in those directions, and for those objects alone, where compulsion would be justifiable. If the legislature were dealing, as in the case of factory operatives, with the physical condition of wives, mothers, and children, their interference is justifiable to prevent the deterioration, the disease and defective development of a class; and the reduction of the hours of labour is the direct means of prevention; but it may be doubted, whether an obstacle would be justifiable to a youth above 12 years of age gaining a livelihood, because the parent had been unmindful of his duties, whereby innocence would be punished, and the impunity of the guilty be confirmed. Restrictions, moreover, should be confined to those who require laws to force them to do right. Those who keep their children at school until and after the age of 12 years, require and deserve no interference by the legislature, which should be limited to those conditions in which parents refuse or neglect to send their children to school in their early youth.

In fixing the age up to which certificates of education should be required—or, in other words—the age during which obstacles should be interposed to the labour of children, regard must be had to the requirements of trade and to the condition of parents. It is truly remarked by the Rev. F. Watkins, Inspector of Schools for Yorkshire, in his report for 1855, p. 268:—

"With large allowance, therefore, for the difference of circumstances, I cannot think that the working-man makes as much sacrifice for his child's education as his more affluent brother does." Admitting that the working-man is able to spare the few pence per week necessary for his child's education, the question is, how shall he be induced to spend those few pence for that purpose? At present the parent has the advantage of his child's earnings; can he be expected, if he be deprived of them, to provide with a good grace for the school-fee out of his diminished earning? It appears from the Reports of the Inspectors of Schools, that about 70 per cent. of the children attending schools under inspection, leave school at 10 years of age. Mr. Watkins reports, that in Yorkshire, 79 per cent. of the children in schools are under 10 years of age. It must, therefore, be beyond doubt, that the children whose labour is required by their parents, have left school long before the age of 12 years. To deprive parents absolutely of their labour before that age would be a direct interference with the labour of those children, and those children especially, whose wages are necessary additions to the family earnings. To interdict juvenile labour would be to force employers to raise the rate of wages; an object desirable enough in one point of view, but an object which the legislature would hesitate to sanction by a direct and positive injunction. The necessity of a certificate, or rather the ability to read, to write, and work sums in the four first rules of simple arithmetic, would not be in itself a veto upon the employment of children of 10 years of age; children of that age, or at any rate children of 11 years of age, who had attended school regularly, would, unquestionably, be entitled to the certificate.

In considering the question of the age, it will be well to refer to the regulations of those foreign countries in which the education of the people has been enforced by the government, because in a matter of detail of this nature their example should have some weight, and because, having the power to make arbitrary laws, to frame those laws so as to ensure the object proposed, and having the desire to secure to the people a sound education, those governments have, doubtless, required the attendance of children at school, for such a duration of time as they have satisfied themselves to be sufficient and necessary.

In Austria the obligation to attend school ceases at 12 years of age.

In Prussia, Saxony, Bavaria, and Wirtemberg, the laws require the attendance of children at school until they have attained the age of 14 years; but actual acquirements are, notwithstanding the general enactments of the laws, preferred to mere attendance at school, and two years' attendance at school is dispensed with in the case of those children who obtain a certificate from their schoolmaster and clergyman, and who are thus released from their school obligations at the age of 12 years.

I have already argued that laws enforcing education should be confined to *children*. Young persons, able to read and write and to work sums, ought to be students in a system purely voluntary. The various Mechanics' and other local Institutions are the proper spheres of study for the youth of the labouring classes. No effort should be withheld, and very much is now doing, especially under the enlightened support of this Society, to promote this voluntary pursuit of knowledge; to induce young men to improve the scanty instruction to which they may have been unavoidably restricted at school. If in childhood they are taught regularity, subjection to discipline, and the mere rudiments which are now proposed, they would be fit to receive and to hold the higher instruction which in later years may be obtained during their leisure hours.

But the whole value of a certificate system would depend upon its practicability. If it could be proved that trustworthy certificates would be obtained; that there would be no special disfranchisement of any class of schools; that the state would only interfere to execute the law; that parents would have free choice o the school, then, perhaps, some serious objections to the compulsory system would be answered; and in proposing a schoolmaster's certificate duly authenticated as a qualification for employment, the scheme is not submitted as one that is free from objection, as a scheme which may be considered fully adequate to meet the real existing wants, but as a commencement, which may lead to the development of a plan better adapted for general employments than is the special factory half-time system of education, a plan more suited to the requirements of the age, and offering more prospect of real and substantial advantage to children.

The trustworthiness of a certificate depends upon the character of the granter, the value of it upon his capacity, and it may be urged that schoolmasters are hardly persons to be entrusted indiscriminately with the granting of certificates. But the principle has been sanctioned by the government, that approved schoolmasters are the persons to whom such power may be confided. Under the existing regulations of the Committee of Privy Council on Education, schoolmasters may grant to children after a public examination, certificates upon forms supplied and counter-signed by the Inspector of Schools. In the several Coal Mine Prize Associations, the certificates are similarly granted by the schoolmasters, and in proposing that schoolmasters of schools not under inspection may be empowered to grant educational certificates, it appears to be better to deal with the means at hand, to accept what is in existence, and to make the best of it, to adapt the scheme to the present state of things, than to make it dependent upon a new state of things which has to be expressly created, and to defer, perhaps indefinitely, the immense amount of good which might accrue from the present means.

The proposition that has been made, that local examiners should hold examinations at frequent intervals for the purpose of granting Educational certificates, would be the most efficient mode of working a certificate system, but it must not be forgotten how elementary is the knowledge that would be required, at any rate at first, of candidates for employment; and how needless, on that account, would be the appointment of special examiners to grant certificates of attainments so slight. For these reasons it would be, perhaps, expedient to bear for a time with the present schoolmasters, (the deficiences of many of whom I acknowledge and lament) inasmuch as the more the necessity of a child learning something, and learning it well, becomes evident, the more rapidly will the schoolmaster and the dame, incapable of imparting the instruction that is required, pass away, and their places be supplied by teachers qualified to grant certificates of far higher attainments.

The question yet remains, in what manner such a scheme would be administered so that it should be generally observed. For the consideration of this question, employments may be divided into three classes:—Establishments already under restrictions; Establishments not under restrictions, but wherein juvenile labour is required; All other employments of children.

There are three kinds of employment of children now under restriction—factories, printworks, mines; and the officers already appointed to carry out the provisions of the several acts relating to them, would respectively be the proper officers to superintend the application in them of any general regulations respecting education.

With respect to the employment of children in mines, Mr. Tremenheere, the inspector of mines, has expressed the strongest opinion of the impracticability of a half-time system, and he advocates a system whereby the employment of children in mines shall be illegal, except upon the production of a certificate periodically, proving them to have previously attended school for a certain number of hours, or, in other words, he advocates the printwork system of education. If this system required the production of a certificate of ability, instead of a certificate of so many hours passed in school at irregular intervals, sometimes upon "Saint Monday," sometimes in the morning, sometimes in the afternoon, it would be an improvement upon the half-time system, but as far as the experience of the printwork system may be relied on, it is a system of the smallest value.

With respect to the employment of children in factories, if, as many persons believe, and as I also am of opinion myself, a child of 12 is capable of performing the work of a child of 13 without injury to health, or detriment to its physical development, it would appear to be a measure of justice to manufacturers to permit the employment of children of 12 years of age for full-time upon the production of an educational certificate. My colleague, Sir John Kincaid, who for some years has urged upon Parliament with much force the substitution of a certificate system instead of the half-time system in factories, has also expressed his opinion, in which he is confirmed by others, that a child of 11 years is fully equal to perform the labour now performed by a young person of 13; but there are good grounds for believing, notwithstanding the precautions contained in the Factory Acts for preventing the employment of children for full-time until the age of 13, that there are, at the present moment, many children employed for full-time in factories who are not more than 12 years of age.

The proof of the attainment of 13 years of age for factory labour, is not a certificate of birth, but the certificate of a surgeon that he is of opinion that the child has the appearance of that age, and is free from disease, &c., which would render him unfit for factory labour—a disqualification, however, not of frequent occurrence.

Although I have great respect for many of the certifying surgeons of my district as men of undoubted ability and honour, and who perform the duties of their office with zeal and fidelity, yet I cannot believe, indeed I know from experience, that "an opinion of the appearance of a child" is not so certain a proof of age as a certificate of birth; and in our joint report for the half-year ending 31st October, 1853, my three colleagues and myself drew the attention of Parliament to the very unsatisfactory condition of this part of the machinery of the Factory Acts.

I do not suppose that the certifying surgeons advisedly pronounce what they know to be an erroneous judgment; but there are many errors of judgment; and the extreme pressure of the parents, their assertions and false statements blind the surgeon to the real appearance of the child. In fact, the certifying surgeon has frequently, and especially when trade is brisk, a very difficult task, requiring great firmness and discretion.

If the certificate system were extended to factories, there ought to be no interference with the half-time system, except between the ages of 12 and 13. Between the ages of 8 and 12, children must still be restricted to half-time, attending school daily; but on the completion of that age, and the production of a certificate, they would be entitled to full-time employment. If, however, children should be unable to produce an educational certificate at the age of 12 years, they would be required to continue upon half-time, and to attend school until the age of 13, when they are entitled by the Factory Acts to work for full-time.

The next class of employment are those trades in which a large number of children are employed.

The institution of some Inspection would here be necessary. In many establishments an inspection would be merely nominal, because the principals, as a measure of their own, in their earnestness for the well-being of their hands, would not only do all that the law might enjoin, but, like some occupiers of factories to whom I could refer, go far beyond the requirements of an Act of Parliament. But in others, especially upon the introduction of a new law, some inspection would be requisite, both to explain the details of the law, to remove any anticipated difficulties in its application, and, if opposed, to enforce its adoption.

The last class of employment comprises all other occupations—mechanical, commercial, and agricultural.

In this class, I conceive a special inspection might not be requisite. There would be, in fact, a supervision perading, constant and non-official. In rural districts where all the residents are known to each other, there would be a constant check upon the premature employment of children. The rector, the curate, the dissenting minister, the Roman Catholic priest, knowing respectively the members of their communion, the visitors of the poor, would, by their presence, be an efficient check. The village schoolmaster may readily know, and in effect does know, what becomes of his pupils. Thus, there would be so much general attention drawn to the subject, that it would be difficult to evade the law; the employer of an uneducated child would be the object of as much distrust as the parent.

The same means would exist in towns, but in a somewhat less effective degree, and to make up for what these agents could not accomplish, the Sunday school teachers, district visitors, and other persons having like opportunities, would exercise a salutary and I believe, a very effective moral control, over the irregular employment of children. All this supervision, this control would be of moral force only, and I believe, as the prohibition would be one of universal application, not of a practice which existed in a certain trade, unknown to the public out of that trade, that if these persons exerted their just influence in their several spheres, a special inspection would be uncalled for, and the infliction of a penalty be rarely necessary.

But the requirement of an educational certificate was proposed to Parliament in 1841, in a bill to regulate labour in silk factories. In that year, a bill was introduced into the House of Commons, by Mr. Fox Maule (now Lord Panmure,) and the late Mr. Shiel, on the part of the government, in which it was proposed that no child under 13 years of age should be employed unless he was able to read the New Testament, and that every child under 13 should be examined once a year by a clergyman; and if he did not certify that satisfactory progress had been made since the last examination, the child could not be employed. And further, that no person under 14 years of age should be employed for more than 10 hours a-day, unless he could read fluently any part of the Holy Scriptures, could write a fair copy in large and small hand, and understood the first four rules of simple arithmetic, and could produce a certificate of such ability.

This bill was withdrawn by the government, together with many others, prior to the dissolution of Parliament; in the reassembling of which, Sir Robert Peel was placed in power, and his government did not adopt this bill of their predecessors.

It may yet be objected, that to require a certificate from every child would be to inflict a serious hardship upon those parents who are really too poor to pay the school-fee. The legislature has already provided for the training of children whose youth has been neglected by their parents, and who have become criminals; it has provided for the instruction of children, not criminals, but from necessity inmates of workhouses; and it has empowered boards of guardians to send to school the children of persons receiving out-door relief; and having thus provided for the children of the least deserving classes, can the legislature refuse much longer to make some provision for the instruction of those children whose parents, not being criminals, nor inmates of workhouses, nor deserters of their children, nor burdens upon their richer brethren, are, nevertheless, unable from poverty to pay school fees and to maintain their children altogether without assistance.

In all the higher grades of employment, guarantees must be produced vouching for the character and ability of the persons employed: in many minor occupations the employers require a satisfactory reference, and through the instrumentality of this society a great impulse has been given to the value of a certificate; and at your invitation all the principal bankers, merchants, traders and manufacturers have declared their readiness to give preference to persons holding certificates granted by the examiners of this Society; and I venture to hope that it is not too much to expect, while they require guarantees from adults, and express a willingness to attach value to certificates of attainments, that the employers of juvenile labour will also give a preference to children, who, in their humble way, present certificates of their honest exertions, and thus will stimulate and reward the sacrifices of the industrious poor.

DISCUSSION.

Mr. F. S. POWELL, having alluded to a report by Mr. Redgrave in 1855 upon the operation of the factory system in France, begged to inquire how far the regulations of the government with regard to the restriction of the hours of labour, &c., in factories had been carried into effect. It was stated in that report, that owing to various local circumstances, those regulations were only partially carried out. He wished to inquire, generally, with regard to the working of the factory systems in Belgium, Germany, and America, and particularly with regard to education in those countries in connection with the factory system.

Mr. REDGRAVE replied, that in Prussia, the half-time system existed nominally, but not in practice, in consequence of the objection to it on the part of the manufacturers. The statute was passed requiring the appointment of inspectors of factories, but none were appointed, and the law remained in abeyance. That law restricted adult labour in factories to 12 hours per day, and short hours for children who were required to attend school. The same might be remarked with regard to France, with the exception of the department of Le Nord; at Lille the regulations were carried into effect rigidly, but he believed in no other part of France.

Mr. HENRY COLE, C.B., said he would take this opportunity of addressing a few words on the general principle of education, and governmental interference with it, rather than attempt to go into the details of the paper that had been brought before them. They might collect from the paper that there was a great deal of caprice about the factory system. It seemed to him that the Government, having found out the means of catching large numbers of people concentrated in factories, had applied to them exclusively rules which, if correct, ought to be applied to the community at large. There appeared to be an anomaly in this, but it was the practice in this country to go on little by little. He ventured to think the principle was correct that the Government should endeavour to see that the people were educated. He thought that was the first point they had to discuss. He ventured, at an agricultural meeting held last autumn, to remark, that he thought what was good for the factory people—if good—was good for the agricultural people too; but the farmers said, "they would not stand it." His remark upon that was, that if the proprietors of factories, who were a very powerful body—if they submitted to the compulsory education of their workpeople, probably the farmers might learn to bear the same infliction. He was not an advocate for Government interference where it could be done without; and where people could act for themselves he thought it was best for the Government to abstain from interference. It might be imagined that because he was connected with the educational department, he had some prejudices upon the subject. He desired to place upon the records of this Society the opinions of one of the soundest writers on Political Economy (and when he mentioned his name he need not say that he was no advocate for despotic interference), he referred to John Stuart Mill, the most eminent political writer in this country, and probably in Europe, at the present time. He had glanced over his work in order to read to them in his own words, which would better show, than any he (Mr. Cole) could employ, the opinions which the author held in reference to the interference of Government in this question of education:—

> "But there are other things, of the worth of which the demand of the market is by no means a test; things of which the utility does not consist in ministering to inclinations, nor in serving the daily uses of life, and the want of which is least felt where the need is greatest. This is peculiarly true of those things which are chiefly useful as tending to raise the character of human beings. The uncultivated cannot be competent judges of cultivation. Those who most need to be made wiser and better usually desire it least, and if they desired it, would be incapable of finding the way to it by their own lights. It will continually happen, on the voluntary system, that the end not being desired, the means will not be provided at all, or that the persons requiring improvement having an imperfect or altogether erroneous conception of what they want, the supply called forth by the demand of the market will be anything but what is really required. Now, any well-intentioned and tolerably civilised Government may think without presumption that it does or ought to possess a degree of cultivation above the average of the community which it rules, and that it should therefore be capable of offering better education and better instruction to the people than the greater number of them would spontaneously demand. Education, therefore, is one of those things which it is admissible in principle that a government should provide for the people. The case is one to which the reasons of the non-interference principle do not necessarily or universally extend.
>
> "With regard to elementary education, the exception to ordinary rules may, I conceive, justifiably be carried much further. There are certain primary elements and means of knowledge which it is in the highest degree desirable that all human beings born in the community should acquire during childhood."

We might take it for granted that they were all agreed that everybody ought to be able to read and write. At the same time, he did not think mere reading and writing would make human beings all that they ought to be. It only helped them a little way on. He would not theorise upon fine-drawn schemes of education of the affections, and those imperceptible matters which a child acquired under the influence of home education; but he might safely aver, that everybody ought to read and write, and acquiescing in that proposition, he would ask them not to shrink from taking those means that would help the people to read and write.

> "If their parents, or those on whom they depend, have the power of obtaining for them this instruction, and fail to do it, they commit a double breach of duty, towards the children themselves, and towards the members of the community generally, who are all liable to suffer seriously from the consequences of ignorance and want of education in their fellow-citizens. It is, therefore, an allowable exercise of the powers of government to impose on parents the legal obligation of giving elementary instruction to children. This, however, cannot fairly be done without taking measures to ensure that such instruction shall be always accessible to them, either gratuitously or at a trifling expense.
>
> "It may, indeed, be objected that the education of children is one of those expenses which parents, even of the labouring class, ought to defray; that it is desirable that they should feel it incumbent on them to provide, by their own means, for the fulfilment of their duties, and that by giving education at the cost of others, just as much as by giving subsistence, the standard of necessary wages is proportionally lowered, and the

springs of exertion and self-restraint are so much relaxed. This argument could, at best, be only valid if the question were that of substituting a public provision for what individuals would otherwise do for themselves, if all parents in the labouring class recognized and practised the duty of giving instruction to their children at their own expense. But, inasmuch as parents do not practice this duty, and do not include education among those necessary expenses which their wages must provide for, therefore, the general rate of wages is not high enough to bear those expenses, and they must be borne from some other source. And this is not one of the cases in which the tender of help perpetuates the state of things which renders help necessary. Instruction, when it is really such, does not enervate, but strengthens as well as enlarges the active faculties. In whatever manner acquired, its effect on the mind is favourable to the spirit of independence; and when unless had gratuitously it would not be had at all, help in this form has the opposite tendency to that which in so many other cases makes it objectionable—it is help towards doing without help."

If they looked at the principle of the Poor Law, they found that the more worthless people were helped, the less they would help themselves; but the more they helped a child, the more independent they made him in after years. Therefore, those who talked in high-sounding phrases about liberty, could only prove the worth of their assertions by being prepared to educate the children.

"In England, and most European countries, elementary instruction cannot be paid for at its full cost, from the common wages of unskilled labour, and it would not if it could."

He did not agree with the author in this. He believed if they could train up the labouring population to forego their useless pot of beer, the money saved would be employed in the education of their children. In his experience of country life, he had often seen the agricultural labourer forego his 2d. per week from his beer in order to educate his children.

"The alternative therefore is not between government and private speculation, but between a government provision and voluntary charity; between interference by government, and interference by associations of individuals, subscribing their own money for the purpose, like the two great School Societies. It is, of course not desirable that anything should be done by funds derived from compulsory taxation which is already sufficiently well done by individual liberality. How far this is the case with school instruction, is, in each particular instance, a question of fact. The education provided in this country on the voluntary principle has of late been so much discussed, that it is needless in this place to criticise it minutely, and I shall merely express my conviction, that even in quantity it is, and is likely to remain, altogether insufficient, while in quality, though with some slight tendency to improvement, it is never good except by some rare accident, and generally so bad as to be little more than nominal."

They knew that schools had very considerably improved during the last twenty years; but if they went into many schools—some of which he could mention—schools well inspected, well endowed, and getting government grants, and receiving substantial aid from the benevolent in the district—if they went into such schools and put a question to the children out of the rote taught by their books, they were puzzled to give an answer. Mr. Cole then related some anecdotes of schools within his own experience, to show the truth of this observation. Mr. Mill went on to say—

"I hold it therefore the duty of government to supply the defect by providing elementary schools, accessible to all the children of the poor, either freely, or for a payment too inconsiderable to be sensibly felt; the remainder of the cost to be defrayed, as in Scotland, by a local rate, that the inhabitants of the locality might have a stronger interest in watching over the management, and checking negligence and abuse."

A rate was a thing they hated in this country. To show how little they were really in earnest on the subject of education, it was a fact that not one town in England—not even Manchester itself, which had been begging for a local rate for the purposes of education, for the last ten years—was prepared to have a local rate administered by its municipal authorities, for teaching the people indiscriminately to read and write. Rates were odious things, and people were not sufficiently in earnest to bear such an infliction for the sake of education.

"One thing must be strenuously insisted on; that the government must claim no monopoly for its education, either in the lower or in the higher branches; must exert neither authority nor influence to induce the people to resort to its teachers in preference to others, and must confer no peculiar advantages on those who have been instructed by them. Though the government teachers will probably be superior to the average of private instructors, they will not embody all the knowledge and sagacity to be found in all instructors taken together, and it is desirable to leave open as many roads as possible to the desired end. Nor is it to be endured that a government should, either *de jure* or *de facto*, have a complete control over the education of the people. To possess such a control, and actually exert it, is to be despotic. A government which can mould the opinions and sentiments of the people from their youth upwards, can do with them whatever it pleases."

That, he believed, was quite true; but at the same time he was not prepared to say that teaching people to read the free press of this country had any tendency to encourage despotism.

"Though a government, therefore, may, and in many cases ought to establish schools and colleges, it must neither compel nor bribe any person to come to them; nor ought the power of individuals to set up rival establishments to depend in any degree upon its authorization. It may be justified in requiring from all the people that they shall possess instruction in certain things, but not in prescribing to them, how or from whom they shall obtain it."

That was the whole gist of the question of education in this country. When public opinion ripened to a demand for education, the only thing the state had a right to do was to step in on behalf of the poor and the feeble, and enable them to obtain it; and so far he hoped that all who, like himself, disliked government interference, would be prepared to go.

"In the matter of education, the intervention of government is justifiable, because the case is not one in which the interest and judgment of the consumer are a sufficient security for the goodness of the commodity. Let us now consider another class of cases, where there is no person in the situation of a consumer, and where the interest and judgment to be relied on are those of the agent himself, as in the conduct of any business in which he is exclusively interested, or in entering into any contract or engagement by which he himself is to be bound.

"The ground of the practical principle of non-interference must here be, that most persons take a juster and more intelligent view of their own interest, and of the means of promoting it, than can either be prescribed to them by a general enactment of the legislature, or pointed out in the particular case by a public functionary. The maxim is unquestionably sound, as a general rule; but there is no difficulty in perceiving some very large and conspicuous exceptions to it. * * * The individual who is presumed to be the best judge of his own interests may be incapable of judging or acting for himself; may be a lunatic, an idiot, an infant; or, though not wholly incapable, may be of immature years and judgment. In this case, the foundation of the *laisser-faire* principle breaks down entirely. The person most interested is not the best judge of the matter, nor a competent judge at all. Insane persons are everywhere regarded as proper objects of the care of the state. In the case of children and young persons, it is common to say that though they cannot judge for themselves, they have their parents or other relatives to judge for them. But this removes the question into a different category, making it no longer a question whether the government should interfere with individuals in the direction of their own conduct and interests, but whether it should leave absolutely in their power the conduct and interests of somebody else. Parental power is as susceptible of abuse as any other power, and is, as a matter of fact, constantly abused. If laws do not succeed in preventing parents from brutally ill-treating, and even from murdering their children, far less ought it to be presumed that the interests of children will never be sacrificed in more common-place and less revolting ways to the selfishness or the mistakes of their parents. Whatever it can be clearly seen that parents ought to do or forbear for the interests of children, the law is warranted, if it is able, in compelling to be done or forborne, and is generally bound to do so.

> To take an example from the peculiar province of political economy; it is right that children and young persons not yet arrived at maturity, should be protected, as far as the eye and hand of the state can reach, from being overworked. Labouring for too many hours in the day, or on work beyond their strength, should not be permitted to them; for, if permitted, it may always be compelled. Freedom of contract, in the case of children, is but another name for freedom of coercion. Education, also, the best which circumstances admit of their receiving, is not a thing which parents or relatives, from indifference, jealousy, or avarice, should have it in their power to withhold."

He knew of no treatise on education which seemed to him so clearly to define what was within the province of the state and what was not, as these passages which he had quoted from the writings of Mr. Mill. He would remark that, although they had the half-time system in factories, the introduction of that system into other fields of labour seemed to him a hopeless task of detail. He thought the one thing in which the state might usefully step in was to insist that a child under a certain age, be it 8, or 10, or 12 years, should not be employed unless it could read and write. To that extent he thought the government was entitled to go. He was not prepared to say that the present half-time system of education was the right one, or that it might not be carried further, but he hoped the meeting would go with him to the extent of saying that it was the bounden duty of the state to see that every child should be able to read and write.

The Rev. Dr. Booth, F.R.S., begged to recall the attention of the meeting to the great object of the very excellent paper just read, which appeared not so much to question the principle of the half-time system as to point out the inadequacy of the provision of the Factory Act, which constituted a mere shutting up within the four walls of a schoolroom the legal test of educational proficiency. It is no wonder that parents should seek to comply with such absurd and worthless conditions on the cheapest possible terms. He was entirely of opinion that the correlative conditions of supply and demand held as much in the case of education, or rather instruction, as in those of cotton or coal. Create a demand for education and the supply would be sure to follow. We had hitherto been going on the inverse principle, attempting to create an abundant supply for which there was no demand. He entirely agreed with the lecturer in his proposal to substitute attainments—certificated attainments, instead of an objectless confinement. He was much pleased to hear the preceding speaker (Mr. Cole), enunciate so clearly the true functions of the state in this matter of education; namely, to test results themselves, but not overmuch to interfere with, or scrutinise how or where the results had been obtained. It was a great satisfaction to him to hear such sentiments expressed, because they echoed the convictions he published in a pamphlet form, (little read he regretted to say at the time,) in which, under the title "Examination the Province of the State;" he endeavoured to lay down the true functions of the state in matters of education. He could not entirely agree with Mr. Redgrave in his regrets that the school-time had been cut down from six hours to three, were *bonâ fide* instruction given in the three hours, because we must not imagine that a child learns twice as much in six hours as he does in three. In this case twice three was not six, but very much less. He considered there were many advantages in the half-time system when faithfully carried out, it called into action all the powers of the mind and body; it had been tried in many places and its advocates spoke highly of it; among others, Mr. Paget, M.P. for Nottingham, who had tested it in agricultural employment. He might add that the same gentleman, and many others as well, with whom he had discussed the question, entirely approved of what this Society was doing, of which the course pointed out in the paper read that evening was an extension, to make proved instruction attested by an authorised certificate the passport to employment.

Mr. Charles Hindley, M.P., could not help regretting that this discussion had taken a wider and more general scope than the title of the paper indicated. He thought the half-time system, which had been introduced into the Factory Act, was at the time very properly objected to on the part of the trade, for he thought it was invidious to make a selection of the factory owners and put upon them the obligation to educate the children, a duty equally incumbent on other branches of industry. The fact that the children were collected together in large numbers in factories, did not render justifiable that measure of the government. Perhaps they would say—why interfere with the factories at all? Mr. Redgrave was, no doubt, aware that he (Mr. Hindley) had been an advocate of the Factory Bill all along, and he might be thought inconsistent in making the statement he did now; but he must be permitted to say, that the question of education and the laws of labour in the factories, rested upon very different principles. They had a right to impose upon the factory owner a restriction as to the hours of labour, for this reason—that factory labour was compound labour, but they had no right to restrict the employers of labour in other respects. They had the labour of the adult male and female, and also the labour of the child. Take the case of two knives,—take what they called at school a stick-knife and a pen-knife; it was quite obvious that while they could cut a stick with the stick-knife, they could not cut a stick with the pen-knife. Again, in a pair of scissors they had a tender blade and a strong blade combined in one instrument; they must confine the things they would cut with the scissors to what the lighter blade would allow them to do, or else they would destroy the instrument. He thought that was an illustration of the factory system. They could not employ the child with advantage to the state to such a degree as would destroy its physical energies,—that would be creating a great evil; and therefore they must adapt the number of hours of labour to the physical conditions of the two classes—the adult and the child. At the same time, he saw no ground why they should compel the factory owner to educate the people under him. The factory owners, he believed, were as desirous of educating the people, as any other portion of the community. He was convinced this compulsory system was injurious to the cause of the factory people, and had tended to make factory owners enemies to the cause of education generally. He had tried the voluntary principle, and thought whatever it accomplished, it accomplished better than compulsion, and as far as it went he should always advocate that principle. But would any one present say that the people could be educated upon the voluntary principle? He had raised £20,000 in one meeting towards that object and had travelled thousands of miles to raise subscriptions; but he had come to the conclusion, from the reasoning of Mr. Cole, as well as from his own observation, that in the present state of things the voluntary principle alone would not suffice. When he heard in the House of Commons of this objection to that scheme, and that objection to another scheme, and yet saw the ragged children running about the streets and courts, he said—let them have any and every scheme, so only that this state of things might be altered.

The Earl of Ducie expressed his gratification at hearing the very able paper of Mr. Redgrave. He had come to the conviction, which probably most of them had done—that the present half-time system, however well adapted as an initiatory measure for saving a vast number of children of tender years from labour which crushed them into physical deformity, had entirely failed, as an educational measure. Besides the other objections brought forward by Mr. Redgrave, there was one which, in his (Lord Ducie's) opinion, was the greatest objection of all, namely—that it seemed to be inapplicable as a general measure. Nothing short of the system of certificates seemed likely to meet the deficiency, and even in that he thought there would be difficulty in carrying out the various details.

The Rev. J. G. C. Fussell apprehended that the real difficulty in bringing this measure of Mr. Redgrave's into extended operation would be this: It could be easily applied to any large employers of juvenile labour, but the real question in his mind was how they were to get at the boys who were employed for half the day in private houses; how were they to bring the certificate system to bear upon them? He warned Mr. Redgrave that he would find great difficulty in carrying out his measure. It would be so completely to the interest of the boys employed, and those who employed them, to evade the law in this respect, that he was certain the evasions would be very numerous indeed. It was, however, consolatory to know that the cause of education had at least gained something by the provisions relating to factories.

Mr. C. Wentworth Dilke said it would always be a matter of great difficulty to secure agreement upon the question of the education of the masses. He thought one great merit of Mr. Redgrave's scheme was that it caught the very class which the last speaker said would endeavour to evade it. Practical education in the agricultural districts was far behind that in towns, where they had better opportunities of bringing children together in schools. In the agricultural districts he confessed he did not know how they were to be got hold of except by some system like that which Mr. Redgrave had sketched out; and for that reason he should be inclined to support the view taken.

Mr. G. F. Wilson, F.R.S., said that Mr. Redgrave in his valuable paper had expressed his opinion of the value of educational certificates, and Dr. Booth had spoken of education being made the pre-requisite of employment. The principle of making some schooling the condition of getting employment, had been partly tried at the factory day schools of Price's Patent Candle Company. A rule was made that children should only be taken into the works from the school; and after this the parents sent plenty of pupils.

The Chairman in moving a vote of thanks to Mr. Redgrave, said he believed his views upon the question of education were pretty well known in this Society. He had always been an ardent advocate of education in all classes—the upper, the middle, and the poor. The subject was one involved in many difficulties. In the first place, they must decide what education was? Did it mean merely reading and writing? That was not, in his opinion, what was meant by education; but was only a means to obtain an end. There being no definite idea of education in itself, what hope would they have of a satisfactory and fructifying result? It should be something more than mere reading and writing and the four first rules of arithmetic, if they wanted a community to become good citizens and good men. It had long been known, that in the lower classes of society parents would turn their children to profitable account so long as their necessities prompted them to do so. They knew, from the rate of wages, the difficulties with which the labouring classes had often to contend, and they would withdraw their children from school at the earliest possible period in order to turn their labour to account. It was this which led to the application of the law to the employment of children in factories. They formerly worked like pieces of mechanism, not like human beings, and remained pieces of mechanism or something worse to the end of their days. Therefore, the legislature insisted upon these children having education put in their way—no doubt in an inefficient manner—but to a certain extent it was placed within their reach. It was successful at first. The manufacturers submitted to it, and gave their aid to it, but they found, from the figures given by Mr. Redgrave, that the system gradually deteriorated. Why? Because the manufacturers would not be troubled with a greater number of children than was absolutely required, and they preferred adult labour at an increased price to that of children under such restrictions. The question then arose, could they compel people to send their children to school. No free country would submit to this. But if they made it worth the while of the parents to send their children to school, that was a different thing. How could they make it worth their while? By placing education within their reach, and making the labour of the educated child more valuable. Therefore he thought one solution, although a difficult one, was that suggested by Mr. Redgrave. As far as it went, it must, he thought, produce some practical results. The great question was, how could they induce parents to send their children to school? Difficulties ought not to deter them from making such efforts as would assist—though in a minor degree—to remove an evil which, as far as his own judgment went, was likely soon to plunge society into serious social difficulties. No doubt, from the principle advocated by this society, in the carrying out of which Dr. Booth had so much distinguished himself, the best results might be looked for, and he thought it was worthy the consideration of government whether the Mechanics' Institutions, as educational systems or centres, should not receive grants in aid, proper care being taken that the money was not misapplied.

Mr. Redgrave, in reply, said the only remark he would make was with regard to the statement of Dr. Booth, upon the half-time system, which had succeeded so well under Mr. Paget, at Nottingham. He (Mr. Redgrave) looked upon that as a model example. Mr. Paget, employing but comparatively few labourers, sent them to a school of his own—the schoolmaster himself taking great interest in the scholars. There it was natural that the system would succeed much better than was generally the case; but, taking the country through, they could not find the same amount of energy on the part either of the employer and the teacher as in the instance mentioned by Dr. Booth.

A vote of thanks was passed to Mr. Redgrave.

The Secretary announced that on Wednesday evening next, the 4th March, a paper, by Major H. B. Sears, "On Appliances for Facilitating Submarine Engineering and Exploration," would be read. Part I. Submarine Engineering.

GLYCERINE.

A correspondent in Guatemala says glycerine is invaluable for a tropical traveller; a little of it applied to a mosquito-bite instantly relieves; "no scratching and sores on the legs as before; it is perfectly marvellous; and I would not travel on these coasts without it now."

EDUCATIONAL MUSEUM AND MUSEUM OF PATENT INVENTIONS.

The annexed ground plan of the Museum building at Kensington shows the space therein allotted, on the 25th November last, by the Lords Committee of Privy Council for Trade for the Educational Museum, which has taken its rise from the Society's Educational Exhibition in St. Martin's Hall, many articles from which were presented to the Government through the Society of Arts, with a view to the establishment of a permanent museum of education.* It also shows the space allotted to the Commissioners of Patents for the Museum of Models of Patented and other Inventions. Such possessors of models as desire to have them exhibited in the Patent Museum at Kensington, should apply, stating dimensions, and the nature of the Invention illustrated, to the Superintendent, at the Great Seal Patent Office, 25, Southampton-buildings. All models or machines, whether presented to the nation through the Commissioners or lent for a limited period, will be kept in perfect order, and the latter returned to the depositors on demand. They should be sent as soon as possible, to enable the Museum to be open in April next. The public will be admitted free of charge after ten a.m. daily.

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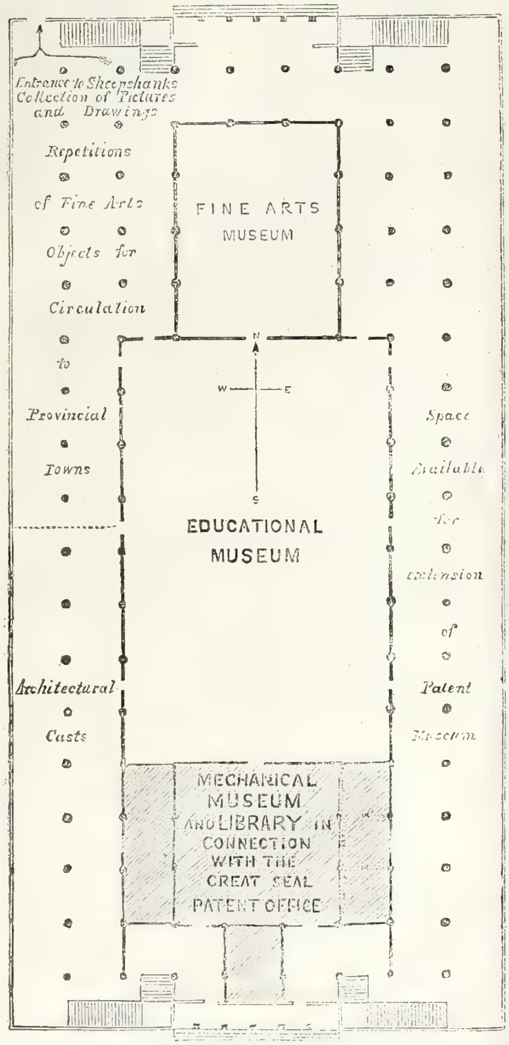
* The regulations with respect to the Educational Museum were given in the last Journal.—Ed. S. A. J.


Entrance to Sheepshanks Collection of Pictures and Drawings
Repetitions of Fine Arts Objects for Circulation to Provincial Towns
FINE ARTS MUSEUM
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W
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EDUCATIONAL MUSEUM
Architectural Casts
Space Available for extension of Patent Museum
MECHANICAL MUSEUM AND LIBRARY IN CONNECTION WITH THE GREAT SEAL PATENT OFFICE

Scale fifty feet to one inch.

Home Correspondence.

THE WESTMINSTER CLOCK AND BELL.

Sir,—The only answer I shall give to the second edition of the letter which Mr. Loseby has got you to print, after the *Builder* had refused it and the *Mechanics' Magazine* had printed it, is that every material statement in it from beginning to end is false, and most of them false within his own knowledge. Anybody who cares to see this more particularly illustrated, may do so in the *Mechanics' Magazine* of February 7.

Besides the general enmity of the clockmakers, Mr. Loseby has special reasons of his own for hating me above most men upon earth, as I have exposed his horological pretensions on several occasions, and helped the Astronomer Royal and Mr. Dent to do the same. And people who in that frame of mind rush into print intending to commit murder, are very apt (as has been well said) to commit suicide by mistake instead.

I should think Mr. Baker, whose injuries Mr. Loseby invokes to help his own fictions, can fight his own battle as well as Mr. Loseby can do it for him. However, as he is invoked, I take this opportunity of saying that I have not the least intention of answering his pamphlet claiming the invention of the mode of hanging the Westminster bells, because I have met with nobody who does not say that there cannot be a better answer to this claim than the drawings he has given of his own plan, and of mine, which, he says, is identical with it.

The fact is, that everybody who has anything to do with the designing, casting, superintending, and hanging of the bells, has disapproved of his plan; which it is true enough that he offered and urged me to adopt, but after I had twice expressed my disapproval of it at the Institute of Architects, and exhibited the one intended to be used, which was approved by everybody who spoke about it, except, of course, Mr. Baker himself and a gentleman whom he brought there to read a paper for him.

I am, &c., E. B. DENISON.

Feb. 23, 1857.

THE ORIGIN OF THE MACHINE FOR MAKING ENDLESS PAPER, AND ITS INTRODUCTION INTO ENGLAND.

Sir,—Numerous persons having allowed themselves to be represented as the inventors of the paper machine, in various Encyclopædias and Dictionaries of Art,[*] and not having attempted to contradict what has been therein said, I feel bound, in justice to the real and first inventor, as well as to myself, to furnish the following authentic particulars relating to this useful and ingenious machine.

Louis Robert, a native of France, is the person to whom we are indebted for the paper machine. I had frequent opportunities of seeing him at work on his first model, in 1796, 1797, and 1798, at the Paper Manufactory at Essonnes, eight leagues from Paris, Département de Seine et Oise, (which at that period belonged to Monsieur Leger Didot, my brother-in-law), where Louis Robert was employed as book-keeper. His first model was no larger than a bird organ, and the slips of paper he made with it not wider than a piece of common tape, but of various lengths. Robert possessed a natural mechanical genius, and was never so happy as when employed in inventing or improving some piece of machinery, but unfortunately, the only time he could devote to his favourite pursuit was in the evening, after the counting-house business was over, and many a time I have heard him blamed and reproached by his employer, M. Leger Didot, for wasting so much time on an invention that would never be brought to perfection. However, Robert persevered, and in about two years, produced a model which performed so satisfactorily, that M. Didot was, at last, induced to afford him the means of making a machine upon a larger scale, which I shall call the working model. Orders were given to the carpenters, smiths, millwrights, and other workmen employed at the manufactory, to take directions from, and execute any work, that Robert might require for his paper machine. In a few months from that time, a machine was completed capable of making paper of the width of Colombier, and of various lengths, being the kind of paper usually employed for paper hangings, of which the consumption in France is immense. Owing to the great difficulty, at that time, of sizing and pressing sheets of paper of great length with the presses usually employed in paper mills, the length was generally limited to twelve yards, but a fresh difficulty arose in the process of drying it; it was suspended on lines in the drying loft, but from its weight when in the wet state it contracted so much in the middle, during the drying, that it was rendered unfit for the use of the paper stainers; the next attempt was by laying these long sheets horizontally on the lines; and by adjusting several of the frames or treblets on a level line, the inconvenience of the partial shrinking of the paper when suspended in a vertical direction was remedied. Many of these long sheets were sold to the paper stainers of Paris. After a series of experiments and improvements, Louis Robert applied to the French Government for a patent, or brevet d'invention, which he obtained in 1799, for a term of 15 years, and was awarded the sum of 8000 francs in testimony of his ingenuity. The specification of this patent is published in the second volume of the Brevets d' Inventions Expirés. M. Leger Didot, at that time, was proprietor and sole director of the paper manufactory at Essonnes, and had contracted with the Government for making the paper for the assignats; this paper was frequently sent in a damp state, in covered carts, drawn by post horses, to the printing office in Paris, was immediately printed and signed by the proper authorities during the night, and as soon as the paper was sufficiently dry, it was issued in the morning to the public. I remember that numerous laughs and jokes took place when M. Didot returned from Paris with a small bundle of assignats under his arm, which was all that he had received in payment of the many cartloads of paper with which he had supplied the government. The only difference was that they had been printed and signed by some of the revolutionary demagogues, then at the head of the government.

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[*] As an example, "*The Imperial Dictionary,*" *English, Technological, and Scientific.* Blackie and Son, Glasgow, Edinburgh, and London.

"Paper Machine.—The machine now used for this purpose is that invented by the Messrs. Fourdrinier. The paper produced by it comes from the machine in an endless web, dried and finished."

Under the word "Paper," in this dictionary, it is stated that Messrs. Louis Robert and Fourdrinier *invented* the machine for making paper. In 1830 a sheet was made 13,800 feet long, and 4 feet wide, in Derbyshire.

The fate of the assignats is well known. I recollect being in Paris during the time they were ordered to be burnt, and I saw their fragments flying over the heads of thousands of persons who had been utterly ruined by their introduction. About this time M. Didot purchased Louis Robert's patent and paper machine for 25,000 francs, to be paid by instalments; but not fulfilling his engagements, the latter commenced legal proceedings against M. Didot, and recovered possession of his patent, by a decision dated 23rd June, 1801. But before that, and about the end of 1800, M. Didot had proposed to me to go over to England and take out patents there for the paper machine, my remuneration to come out of the profits that might be obtained. At that period I held a situation under the British government, in the office of Captain James Coates, of the Royal Navy, who was the British Commissioner for the exchange of prisoners of war in France; and after consulting with that gentleman, and receiving his sanction and advice, I agreed to embark in the undertaking, and to quit Paris in a fortnight, and being an Englishman, and in the employ of the British government, I had no difficulty in obtaining a passport. In the month of March, 1801, I left Paris to proceed to London, and Captain Coates gave me a letter of introduction to T. Mantell, Esq., at that time Mayor of Dover. On arriving at Dover I lost no time in waiting upon that gentleman, who, with true English hospitality, invited me to dine with him, to meet a few of his friends from London, amongst whom was Mr. Millikin, a gentleman residing in Norfolk-street, London. In the course of conversation, during the evening, I informed Mr. Millikin that I was on my way to London to take out patents for a machine for making paper, upon which Mr. Millikin said, that on his return to London, he should be most happy to introduce me to one of the most respectable wholesale stationer's houses in London, that of the Messrs. Bloxam and Fourdrinier. I said I should feel happy to avail myself of the introduction. Upon Mr. Millikin's return to London, I accompanied him to Sherborne-lane, and was introduced to the above-named firm, to whom he mentioned that I was taking out patents for a machine for making paper upon an entirely new principle, and at the same time showed them nine or ten rolls of paper of great lengths, which had been made by Louis Robert's paper machine at Essonnes, with which they were much pleased and astonished. Previous to parting, they said they should be happy to purchase a share in the patents, and requested that they might have the first offer. Soon after the patents were obtained, an agreement was entered into with me for the purchase of one-third of the patent rights, and *this was the first transaction by which the* Messrs. Fourdrinier *became connected with, and interested in the paper mochine.* It was a commercial speculation on their part, which unfortunately did not prove a profitable one, either to themselves or to any of the persons originally connected with it. In the latter part of the year, 1801, I returned to France, for the purpose of having correct drawings made of the machine,—indeed exact copies of those delivered by Louis Robert when he obtained his patent from the French Government. The drawings here alluded to are those I delivered with my specification for my first patent in 1801, and were deposited in the Enrolment Office in Chancery-lane, London. During the short time I remained in Paris, I concerted measures with MM. Leger Didot, and Louis Robert, to have the original working model, which was then at Essonne, sent over to England, as it would materially assist in the construction of other machines. After much trouble and expense, the model arrived safely in London. The short peace (or rather the preliminaries of that desirable event) which took place in 1802, afforded M. Leger Didot the opportunity of coming over to England, when I introduced him to Messrs. Bloxam and Fourdrinier. It being thought desirable to commence a series of experiments for improving the machine, the working model was sent to the factory of Mr. John Hall, at Dartford, who was at that time the millwright of the above firm. As soon as the model was erected and fit for work, different improvements were attempted, and M. Didot and myself passed the greater portion of our time at Dartford, in suggesting, making, and superintending the alterations required. At that period, the late Mr. Bryan Donkin was engaged in business with Mr. Hall, and, being an extremely ingenious and clever mechanician, assisted most materially in improving the paper machine, and in 1803, the French working model, after nearly three years' diligent and unremitting experiments and improvements, was erected at Frogmore Mill, near Two Waters, in Hertfordshire. I left London and removed to Two Waters, for the purpose of superintending and explaining to the different manufacturers, (who had been invited to inspect the machine,) the great advantages it possessed over the old method of paper-making.

In 1805, an entirely new machine was erected at Two Waters Mill, capable of making paper 54 inches wide, and containing all the latest improvements made up to that period. I continued superintending the new machine until 1807, when I removed to St. Neots, in Huntingdonshire, where premises were taken by the Messrs. Fourdrinier for the purpose of erecting the two machines, which I had reserved the exclusive right of using for my own benefit. I entered into partnership with Messrs. H. and S. Fourdrinier, the profits to be divided in equal third shares; the business to be carried on under the firm of John Gamble and Company, which it continued to be until 1811. Messrs. Fourdrinier had agreed, by the articles of partnership, to advance the capital required for carrying on the concern, erecting all the machinery required in a paper manufactory, and the two paper machines which I had the exclusive and unlimited privilege of using for my own benefit, without paying any of the royalties. The unlimited quantity of paper I might manufacture with them, rendered them worth £5,000 each, and in corroboration of this fact, Messrs. Phipps, of Dover, and Mr. Swan, of Evensham, in Oxfordshire, paid £5,000 each for their paper machines as well as for any quantity of paper they might manufacture.

In or about 1809, Messrs. Henry and Sealey Fourdrinier made over to Mr. Matthew Towgood the whole of their interest in the St. Neots Mill, and Mr. Towgood undertook to perform all the engagements entered into by the Messrs. Fourdrinier with me. When Mr. Towgood had the mill transferred to him, only one of my paper machines was erected, the second having been sold to Mr. Bartholomew Sullivan, of Dripsey, near Cork. My two machines were my capital in the concern, but. unfortunately for me, this had not been stated in the partnership deed. Mr. Towgood objected to advance the capital for erecting the second machine unless I would pay my share. Mr. Towgood knew that I had not the requisite capital, and he then determined upon dissolving the partnership, by which act I was deprived of all my interest in the concern, after having sacrificed ten years of the best part of my life to the paper machine.

I am, &c., JOHN GAMBLE.

5, Hanley-road, Hornsey-road, London.

MACHINERY AND WORKMEN.

SIR,—The valuable and interesting paper read by Mr. Anderson, on the 28th ult., on the application of machinery to manufactures, produced a discussion that opened up a subject which I consider of no less importance than the application of machinery, and equally deserving the serious attention of the Society of Arts, and also of every individual, although it did not appear quite relevant to the subject then under consideration. I refer to the statements then made by Mr. Hobbs and Mr. Webster, in reference to the difficulties which appear to arise with the invention of labour-saving machines, and to expand with the development of their powers, as illustrated in the very numerous recorded instances of the obstacles presented to the introduction of such machines into use, by the prejudices of the workmen, sometimes exciting the most determined opposition, even when the wages of the workmen are increased by the introduction of such machines in the process of manufactures; an apparent anomaly, which, Mr. Hobbs told us, was peculiar to the British workman, and did not extend to the United States of America, where the workmen were not only ready at all times to accept the aid of machinery, but were most willing to complete or improve any new machine associated with their labour; now, if such is a fact, which I believe it to be, I think the investigation of the causes producing such results may lead us to the solution of a difficulty which still remains one of the greatest impediments to the adaptation of science to the manufacturing arts.

The nature of man, either in Great Britain or America, is identically the same; therefore such an opposite feeling in the workmen of the two nations, under the assumed same circumstances, must result from a different educational training, or the supposed uniformity of circumstance must be a great fallacy.

That such difference of feeling and action does not result from education, is clearly shown by the fact that a great number of American workmen are of British growth, and no education could suddenly transmute the dissatisfied opponent into the willing and active cooperative assistant.

The cause of such anomaly must be sought for from other and more powerful influences, and a key to the solution of this important problem is, I think, to be found in the existence of such opposite feelings in two sections of the world's industry.

The assumption may be true, and I believe it is so, that the introduction of machinery not only lightens labour, but that it often increases the wages of the workmen whose industry is associated with it, and this equally whether the application is made in Great Britain or America; but here the parallel ceases, for we are told by the exponents of the theory of the inherent prejudice of the British workman, that the development of mechanical appliances to manufactures in America is excited into vigorous action by the much greater scarcity of manual labour, which always stimulates the design and application of labour-saving machines, and, therefore, such application will never excite the prejudice or opposition of any workmen, while they see and feel before them fresh channels of certain occupation, which is the case in the United States of America. But how stands the fact in Great Britain, where a large amount of pauper and criminal labour, which might be profitably employed, is suppressed, lest it should, by coming into competition with the already overstocked market of honest industry, increase the depression of wages; and where there are such causes for fear, is it surprising that the prejudices of British workmen should be excited by the application of the mighty arms of machines, when made to compete with human muscle and sinew, for we cannot disguise the fact, that where a balance of labour and employment exist together, the introduction of any power which increases production, if placed in competition with human labour, must always depress it in a corresponding degree.

These remarks are not intended as an exposition of a subject of the very highest importance, but merely to suggest the necessity of taking into our consideration an influence so powerfully operating upon the application of labour-saving machines to our manufactures and commerce, and in justice to the skilled workmen whose occupation is being superseded by unskilled labour in association with mechanical precision.—I am &c.,

E. NASH.

30, Coppice-row, Clerkenwell, Feb. 10th, 1857.

NAVAL SEMINARIES.

SIR,—It is to be regretted that whilst the Society of Arts is exerting itself so judiciously to promote education, Government should do next to nothing towards the provision of competent persons to supply the different grades in its employ. It would have been far otherwise had the establishment of Naval Seminaries, as successtively determined on by the Earls Spencer and St. Vincent, been carried out. Though it is not likely that, after the lapse of nearly 60 years, Naval Seminaries should in all particulars be found suitable to the present day, yet as they might afford hints for the formation of such establishments now, I venture to submit an outline of Sir S. Bentham's scheme, as proposed and approved of by Earl Spencer at the end of the last century. This plan provided, in the first place, that Government should be at no expense for education, for though boys might be admitted into the seminaries at the early age of seven, paying a smaller sum than could defray their expenses at home, they were to employ a part of their time in useful works, by which their expenses would be fully compensated. There were to be three different classes of pupils. The first class being that of superior officers both in the civil and military service, who were to receive a gentleman's education; the second was to consist of those intended for clerks and similar occupations on shore, or for warrant officers on board ship; the third class was for boys intended as mere operatives. The three classes were to be treated alike in regard to sanitary arrangements, but their food, clothing, &c., to be regulated according to their respective stations in life. All were to work a portion of their time, as Sir Samuel conceived that an adequate knowledge of manual labour could only be acquired by practice, but the working hours were not allowed to encroach on the time required for higher attainments. In order to excite emulation and to reward the most deserving, any boy might, at the periodical examinations, be raised from the lowest to the second class, and again, a lad who had attained the necessary qualifications, might ascend from thence to the highest class. For further particulars, I beg to refer to Sir

Samuel's "Answer to the Comptroller's Objections," pp. 104 to 113; to his "Statement of Services," pp. 12 to 14; and to the report of the Admiralty to the Privy Council in 1801.—I am, &c., M. S. BENTHAM.

26, Wilton-place, Feb. 12th.

DECIMAL COINAGE.

Sir,—I beg you will grant me a little space to correct an erroneous statement in Professor De Morgan's paper, "On Decimal Coinage," in this year's *Companion to the Almanac.*

Referring to the debate of 1855, he accuses the Chancellor of the Exchequer of "playing with statistics," by putting forward, "under four different sets of names, as four different plans, the farthing system, which proposes coins of ¼d., 2½d., 2s. 1d., and £1 0s. 10d. Thus, in one system, a farthing is called a *cash*, in another a *mil*, and so on; it being the same farthing throughout."

With respect to one, at least, of these plans, Mr. De Morgan is entirely mistaken. As its humble proposer, I beg to refer for details to your Journal, Vol. III., page 390, where it will be seen that the "cash" was *not* the $\frac{1}{48}$th of a shilling as asserted by Mr. De Morgan, but the $\frac{1}{50}$th of a shilling, expressly mentioned (*Times* report) by the Chancellor of the Exchequer.

My proposal likewise materially differed from that of Mr. William Brown in rendering unnecessary a fourth copper token, by the simple expedient of making the penny-piece count for *five* "cash" instead of *four* "mils," and the halfpenny and farthing for two "cash" and one "cash" respectively.

I have since submitted to your readers my reasons for abandoning altogether the *millesimal* division of the pound as the basis of a new system.

I am, &c.,
S. A. GOOD.

H. M. Dockyard, Pembroke-dock, Feb. 9, 1857.

Proceedings of Institutions.

Poole.—The second *Conversazione* in connection with the Town Library Literary and Scientific Institution was held at the Town-hall on Monday the 2nd inst. Amongst those present were M. Kemp, Esq., E. Kemp Welch, Esq., the Misses Welch, and the Misses Welch of Christchurch; the Rev. G. Morgan, Mrs. Morgan, Isaac Steele, Esq., Morris Were, Esq., A. P. Hamilton, Esq., M.D., and Mrs. Hamilton, the Rev. E. R. Conder, the Rev. R. Goulty, G. B. Aldridge, Esq., and Miss Aldridge; —McGilvery, Esq., G. Belben, Esq., and Mrs. Belben; T. Durant, Esq., Miss Gosse, Mrs. and Miss Wanhill, J. B. Durell, Esq., D. Durell, Esq., Miss Pardy, J. Adey, Esq., Mrs. Adey and family, Mrs. J. Adey, Miss Adey, T. Eliott, Esq., and Mrs. Eliott, W. C. Nutt, Esq.; Mrs. Churchill, the Misses Chrchill, Mr. and Miss Chaman; E. Mullett, Esq., Mrs. C. Hill, Miss Lacy, Mrs. James Slade, Mrs. Parmiter and Miss Kent, F. Saunders, Esq., T. Saunders, Esq., J. Gould, Esq., J. W. Whelan, Esq., J. Crabbe, Esq., Mrs. and Miss Crabbe, &c., &c. The chair was taken by M. Kemp Welch, Esq., who, regretting the absence of the Hon. and Rev. Samuel Best, called up the Rev. E. R. Conder, who said, that if such Institutions as these were really to tell upon the progress of national education, they must not be made Institutions for the purpose of amusement, but for application to useful practical subjects and hard study. No man became wise by play; neither did any nation become great or wealthy by play. There must be hard work in order to the acquisition of anything which was worth possessing. The question was—in what manner could Literary and Scientific Institutions be made proper means of furthering education? The rev. gentleman then directed the attention of the meeting, to the plans now being carried out by the Society of Arts.—Some very beautiful specimens of Mosaic tiles, manufactured by the Patent Architectural Pottery Company, and many other objects of interest were exhibited in the room, and the evening was enlivened by some good music.—At the annual meeting of the members, recently held, J. Gosse, Esq., in the chair, the report for the past year was read. The Institution at the present time is in a very flourishing condition. The library has been thoroughly repaired, and all the books have been arranged under the different subjects of which they treat. It now contains upwards of 1800 vols.; 160 vols. have been received from Mudie's Circulating Library, making a total of nearly 2,000 vols., to which the members have free access. A new News Room has also been made, distinct from the library. These improvements have been effected out of the annual income of the Institution, which for this year has been £117 12s. The current expenses of the year have been £96 5s. 8d., leaving a balance of £21 available for other purposes. The following gentlemen were unanimously elected to the respective offices:—President: Colonel Waugh; Vice-Presidents: Admiral Brown, J. Adey, J. Browne, J. Durant (Mayor), T. Durant, J. Gosse, W. Pearce, R. Slade, James Slade, I. Steele, M. Kemp Welch, Esqs., H. M. Aldridge, Esq., Treasurer: J. B. Durell, Esq., Librarian: Edwin Kemp Welch, Esq., Curator; Secretary, Mr. W. Penney: Committee; G. H. Gutch, J. Gould, C. Keates, J. W. Martin, E. Mullett, S. Pettit, Joseph Rickman, C. J. Stone, F. Styring, J. Touchet, J. W. West, Esqs., and Mr. J. Budden. In acknowledgement of the valuable services rendered to this Institution during a long course of years by the late Curator, Mr. J. Budden, the thanks of the meeting were cordially awarded to him. A vote of thanks to the Chairman concluded the proceedings.

To Correspondents.

Erratum.—In the last number of the *Journal*, page 212, col. 1, line 63, for "inches" read "miles."

MEETINGS FOR THE ENSUING WEEK.

Mon. Royal Inst., 2. General Monthly Meeting.
London Inst., 7. Rev. H. Christmas, "On the History and Antiquities of Heraldry; and on some other branches of British Archæology."
Chemical, 8. Prof. Abel, "On recent Improvements in the Manufacture of Iron."
Entomological, 8.
Med. and Chirurg., 8. Anniversary.
Tues. Royal Inst., 3. Prof. Huxley, "On the Sense of Sight."
Civil Engineers, 8. Mr. Jabez Church, C.E., "On the Results of the Use of Clay Retorts for Gas-making."
Linnæan, 8. Prof. Owen, "On the Characters and Subdivisions of the class *mammalia*."
Pathological, 8.
Wed. London Inst., 3. Mr. E. W. Brayley, "On Mineralogy and Crystallography."
Royal Soc. Lit., 4½.
Society of Arts, 8. Major H. B. Sears, "On appliances for facilitating Submarine Engineering and Exploration." Part I. Submarine Engineering.
Microscopical, 8.
Pharmaceutical, 8½.
Thurs. Royal Inst., 3. Prof. Tyndall, "On Sound."
Philosophical Club, 5½.
London Inst., 7. Dr. R. E. Grant, "On the Natural History of Extinct Animals."
Antiquaries, 8.
Philological, 8.
Photographic, 8.
Royal, 8½.
Fri. Archæological Inst., 4.
London Inst., 8½. Mr. E. B. Denison, "On the Great Bell of Westminster."
Sat. Asiatic, 2.
London Institution, 3. Mr. T. A. Malone, "On Experimental Physics, chiefly in Relation to Chemistry."
Royal Institution, 3. Prof. Phillips, "On the Origin and Progress of Life on the Globe—Vertebrata."
Royal Botanic, 3¾.
Medical, 5. Anniversary Oration.

PARLIAMENTARY REPORTS.

SESSIONAL PRINTED PAPERS.

Par. No.

Delivered on the 14th and 16th February, 1857.

Affairs of Naples—Correspondence.
Queen's College, Galway—Report.
Queen's College, Belfast—Report.
Prisons—Twentieth Report of the Inspectors (Home District), Part I.

Delivered on the 17th February, 1857.

23. Savings' Banks (Number of Depositors, &c.)—Account
24. Savings' Banks (Sums paid in or withdrawn by the Trustees)—Return.
28. Russian Dutch Loan—Account.
29. Sardinian Loan—Account.
30. Greek Loan—Account.
43. Paupers—Returns (a corrected copy).
6. Bill—Reformatory Schools.

Delivered on the 18th February, 1857.

4. Grants for Religious Purposes—Return.
26. Naval Receipt and Expenditure—Account.
36. Bank of England—Copy of Applications, &c.
39. Bullion (Bank of England)—Return.
45. Local Acts (1. Birkenhead Docks—Construction ; 2. Carlisle, Liddesdale, and Hawick Railway ; 3. Ely Tidal Harbour and Railway ; 4. Great Yarmouth Britannia Pier ; 5. West Somerset Railway ; 6. West Somerset Mineral Railway)—Admiralty Reports.
China (Registration of Vessels at Hong Kong)—Correspondence.

Delivered on 19th February, 1857.

35. Bank of England—Annual Accounts.
40. Mint—Account.
44. Trade and Navigation Accounts (31st December, 1856).
55. Debt (Funded and Unfunded)—Return.
16. Bill—Public Health Supplemeutal Bill (1857).

Delivered on 20th February, 1857.

2. County Elections—Return.
8. Highways (Metropolis)—Return.
38. Education (Capitation Money)—Return.
42. Army in the East—Return.
17. Bills—Lunatic Asylums (Ireland).
18. ——— Sea-coast Fisheries (Ireland).
21. ——— Education (Cities and Boroughs).
Fire Insurance Duties—Report by Mr. Coode.

Delivered on the 21st and 23rd February, 1857.

47. Poor-relief (Ireland)—Returns.
27. Irish Reproductive Loan Fund—Account.
50. Bishops (Scotland)—Correspondence.
54. Court of Chancery—Return.
56. Criminals—Copies of Memorials.
11. Bills—Industrial Schools.
22. ——— Extra-parochial Places.
24. ——— Minister's Money (Ireland).
27. ——— Lighting of Towns (Ireland).
Marriages in Ireland—6th Report of the Registrar-General.
Operations in the Canton River—Further Correspondence.
China (Entrance into Canton)—Correspondence.
Civil Service Commissioners—2nd Report.

Delivered on the 24th February, 1857.

57. Army, Crimea—Returns.
33. Army Estimates.
Insults in China—Correspondence.
Queen's College, Cork—Report.

Delivered on the 25th of February, 1857.

19. Harbour, &c., Bills (1, St. Helen's Canal and Railway ; 2, Clyde Navigation)—Report of the Board of Trade.
44 (1). Trade and Navigation Accounts (31st January, 1857).
49. Spirits (Navy)—Copies of Contracts.
23. Bill—Court of Chancery (Ireland)—(Titles of Purchasers).
25. Bill—Court of Chancery (Ireland).

PATENT LAW AMENDMENT ACT.

APPLICATIONS FOR PATENTS AND PROTECTION ALLOWED.

[*From Gazette, February 20th*, 1857.]

Dated 17th December, 1856.

2993. Godwin Meade Pratt Swift, Viscount Carlingford, Swiftseath, Kilkenny—An aerial chariot or apparatus for navigating the air.

Dated 2nd February, 1857.

17. John Wilson, St. Helen's, Lancashire—Improvements in the manufacture of steel.

Dated 8th January, 1857.

64. Julius Goodman, Abraham Myers, and Louis Goodman, 25, King David lane, Shadwell—Improvements in the manufacture of caps or coverings for the head.

Dated 21st January, 1857.

186. Henry Medlock, 20, Great Marlborough-street, Westminster—An improved method of purifying water.

Dated 26th January, 1857.

226. Adolphe Hensel, 4, Stafford-place, Pimlico—The manufacture of German yeast from flour.

Dated 2nd February, 1856.

303. John Henry Johnson, 47, Lincoln's-inn-fields—Improvements in heating the feed-water of steam-boilers. (A communication.)

Dated 3rd February, 1856.

311. Richard Laming, Hayward's-heath, Cuckfield, Sussex—Improvements in purifying gas, in obtaining materials useful for that purpose, and in working up into useful products certain ammoniacal and phosphatic substances obtainable as residues in the purifying of gas.
312. James Taylor, Middlesbrough-on-Tees, Yorkshire—Improvements in the governors for the engines of screw steamers, and other vessels propelled from the stern.
313. James Taylor, Middlesbrough-on-Tees—A compensating crane.
314. George White, 5, Laurence Pountney-lane, Cannon street—Certain improvements in dyeing and printing textile fibres and fabrics. (A communication.)
315. Charles Cochrane, Ormesby Iron Works, Middlesbro'-on-Tees—An improvement in heating blast for blast furnaces and cupolas.
317. Henry Unwin, Sheffield—Improvements in the application of waste heat from coke ovens.

Dated 4th February, 1857.

318. Andrew Steinmetz, Middle Temple—A method, mode, contrivance, or management to check the honesty of omnibus conductors and other receivers of money under similar circumstances, to be accounted for to their employers, without machine or mechanical appliance.
319. James Hamsher, 16, Elizabeth-street South, Pimlico—Improvements in the manufacture of blacking for polishing, softening, and preserving boots and shoes, and other leathern articles.
320. Odoardo Gandine, 4, Newman-street, Oxford-street—An indicating target.
321. Edward Lewis and Gideon Bohm, Coleman-street—Improvements in printing in colours, called an improved photogalvanographic chromographic process.
323. Saul Hart, 33, Portland-street, Liverpool—Improvements in apparatus for raising and forcing water.
324. Charles De Bergue, 9, Dowgate-hill—Improvements in the method of, or apparatus for, laying the permanent way of railways.
325. William Edward Newton, 66, Chancery-lane—Improvements in pianofortes (A communication.)
326, Alfred Vincent Newton, 66, Chancery-lane—An improvement in machinery for polishing flat surfaces of glass and other substances. (A communication.)
327. James Burrows, Wigan—Certain improvements in steam engines.
328. John Henry Johnson, 47, Lincoln's-inn-fields—Improvements in the treatment of flax and similar textile materials. (A communication.)
329. Robert Holmes Houston, Greenock—Improvements in effecting general conveyance or transport on water.

Dated 5th February, 1857.

330. Thomas Summers, Northam Iron Works, Southampton—Improvements in gauges for indicating pressure and vacuum.
331. Philipp Schafer and Frederick Schafer, Brewer-street—Improvements in travelling bags, or cases, and an apparatus for carrying fittings therein.
332. Alfred Vincent Newton, 66, Chancery-lane—An improvement in casting metallic articles. (A communication.)
333. Clarance Brazil and William Nicholas Crummack, Chorley, Lancashire—Improvements in looms for weaving.
334. Henry Smith, Stamford, Lincolnshire—Improvements in haymaking machinery.
335. William Edward Newton, 66, Chancery-lane—Certain improvements in breech-loading fire-arms. (A communication.)
336. George Chowen, 7, James-street, Covent-garden—Preventing further casualties on the Goodwin Sands.

Dated 6th February, 1857.

337. Thomas Stott, Sabden, near Whalley, Lancashire—Improvements in pickers.
339. William Green, Pembroke-cottages, Caledonian-road, Islington—Improvements in manufacturing or producing substitutes for leather for boots, shoes, and other uses, and in machinery or apparatus for effecting the same.
340. Richard Archibald Brooman, 166, Fleet-street—Improvements in preparing or dressing threads and other fibrous materials, and in the machinery employed therein. (A communication.)
341. James Gilroy, Auldhousefield, near Pollockshaws, Renfrew—Improvements in applying starch or other semifluid matter by machinery to woven fabrics.
342. John Mayo Worrall, Salford—An improvement in finishing a certain description of fustians called "diagonals."
343. George Wright, Sheffield—Improvements in stove grates or fireplaces.
344. Thomas Newton, Walsall—Improvements in the construction of Stockmen's saddles and appendages thereto. (Partly a communication.)
345. Antoine Dècle and François Alexandre Drault, Paris—Improvements in the manufacture of bracelets.
346. Pierre Poisson, Paris—Improvements in preparing and applying surfaces for painting.

Dated 7th February, 1857.

347. Henry Heald and Arthur Heald, Sabden Whalley, Lancashire—Improvements in looms, and in pickers used for weaving.
348. Nicholas Nomico, Manchester, and George Heyes, Bury—Improvements in looms.
349. James Alfred Limbert, Royal Navy—Improvements in marine steam engines.
350. John Coope Haddan, 4, Cannon-row, Westminster—Improvements in marine steam engines. (A communication.)

351. Charles Crickmay, Guildford-place, Lower Kennington-lane—Certain improvements in breech-loading guns or pistols for military and other purposes, and which said improvements are applicable, and will admit of being applied, to guns or pistols now in use.
352. Francis Wrigley, Manchester—An improved apparatus for cutting tobacco.
353. John Henry Johnson, 47, Lincoln's-inn-fields—Improvements in casting metals. (A communication.)
354. Joseph Nicolas Victor Cadiat, Paris—The application of centrifugal force in purifying minerals, or any other similar hard substances, by washing.
355. Joseph Skertchly, Culford-road, De Beauvoir-square—Improvements in, and in the manufacture of saggers.
356. William Greenslade, Bristol, and James Wood, Saint Pancras—Certain improvements in brushes, especially applicable to painters' brushes.
357. James Taylor, Upper-street, Islington, and Edward Owen, Aberdeen-terrace, Blackheath—Improvements in the manufacture of yellow prussiate of potass.
358. Felix Lieven Bauwens, Ranelagh-road—An improved mode of treating and distilling fatty matters, and in the apparatus employed therein.
359. Thomas Brown and George Parry, Ebbw-vale, Monmouth—Improvements in the manufacture of iron.
360. Richard Archibald Brooman, 166, Fleet-street—An improved method of obtaining motive power. (A communication.)
361. Richard Archibald Brooman, 166, Fleet-street—Improvements in measuring the capacity and contents of casks and other similar vessels, and in instruments or apparatus employed therein. (A communication.)
362. George Tomlinson Bousfield, Sussex-place, Loughborough-road, Brixton—Improvements in lamps adapted for burning resin oil. (A communication.)
363. William Hirst, Bath—Improvements in manufacturing felted fabrics.
364. William Wilkens, Baltimore, U.S.—An improved cannon, which he calls a revolving battery. (A communication.)
365. Perceval Moses Parsons, Duke-street, Adelphi—Improvements in the permanent way of railways.

Dated 9th February, 1857.

366. James Murdoch, 7, Staple-inn—An improvement in the process of treating the threads of floss silk, which is also applicable to the threads of other fibrous materials. (A communication.)
367. James Taylor, Britannia Works, Birkenhead—Improvements in machinery for crushing various substances.
368. Henry Cartwright, Dean Broseley, Shropshire—Improvements in the application and mode of working eccentrics on steam engines.
369. Charles Turner and Louis Watermann, Liverpool—Improvements in or applicable to the class of hats made from straw, grass, palm leaf, or other like materials.
370. Léon Talabot, 57, Chaussée d'Antin, Paris—Improvements in the manufacture of iron and steel.
371. Joseph Fenn, Newgate-street—An improvement in oil-cans and other like vessels. (A communication.)
372. David Falconer, 68, Causeyside, Paisley—Improvements in the mechanical arrangement for raising and forcing of water or other fluid, air, or gases.
373. John Harding, Beeston Manor Iron Works, Leeds—Improvements in the treatment of metallic ores.
374. Thomas John Taylor, Sekforde-street, Clerkenwell—An improved construction of stereoscope.
375. Samuel Groves, Judd-place East—Improvements in organs.
376. Henry Willis, Manchester-street, Gray's-inn-road—Improvements in organs.

Dated 10th February, 1857.

377. William Thomas Walker, 55, King-square, St. Lukes—Improvements in apparatus used in gas works for exhausting, forcing, transmitting, and regulating the flow of gas, and cleansing and warming gas apparatus.
378. Abel Stokes, Birmingham—New or improved machinery to be used in the manufacture of nails, pins, screws, and other similar articles.
379. Julian Bernard, the Albany, Piccadilly—Improvements in the manufacture or production of boots and shoes, or coverings for the feet, and in the machinery or apparatus employed in such manufacture.
380. Daniel Benjamin Herts, Bunhill-row—Improvements in apparatus for stamping and embossing. (A communication.)
381. Benjamin Webster Owrid, Dundalk, Louth—An improved method of connecting and disconnecting pipes or tubes.
382. Joseph Graham and James Shepherd, Burnley, and Thomas Whitaker, Acrington—Certain improvements in power looms for weaving.
383. Jabez Morgan, Kidderminster—Certain improvements in the manufacture of steel and iron wire for umbrella and parasol frames.
384. William Richelieu Hodges, Manchester—Improvements in the manufacture of an elastic material, and of its application to certain purposes.
385. Austin Chambers, Canterbury, and William Harrison Champion, Lynsted, Kent—A mode of working railway breaks.
386. George Bedson, Manchester—Improvements in coating metal with metal and metallic compounds.
387. August Frederick William Partz, New York—An improved method of evaporating fluids, condensing and absorbing vapours, gases, and fumes, arresting and precipitating floculent, metallic, or other particles, and transferring heat from air or steam to fluids and pulverulent substances.
388. Thomas Fielding Johnson and John Williams, Leicester—Improvements in screw gill machinery for preparing wool and other fibrous materials.
389. John Forrest Watson, St. John's-square, Clerkenwell—Improvements in the construction of watches.
390. Jesse Bridgwood, Burslem, Staffordshire Potteries—Improvements in connecting pipes to the basins of water-closets and wash-hand basins, and also in the means of stopping the outlets of wash-hand basins.
391. William Wood Pilcher, St. Margaret's-at-Cliffe, Dover—Improvements in straw shakers of thrashing machines.
392. Abraham Royds and John Kenyon, Lower-place, Rochdale—Certain improvements or a certain improvement in machines for spinning or doubling, commonly known as throstles.
393. Richard Archibald Brooman, 166, Fleet-street—An improvement in or addition to the locks of fire-arms. (A communication.)
394. Thomas Howard, King and Queen Iron Works, Rotherhithe—Improvements in the construction of cranked shafts or axles.
395. Henry Heald and Arthur Heald, Sabden Whalley, Lancashire—Improvements in pickers and picker checks employed in weaving.
396. Henry Tibbets Ropes and David Wilson Thomas, Liverpool—Improvements in the application of filters to cocks, taps, or other valves used to draw off liquids. (A communication.)

WEEKLY LIST OF PATENTS SEALED.

February 20th.

1959. Thomas John Chipp and Richard Bitmead.
1966. Edward Hallen.
1969. William Racster.
1971. Alexander Moses.
1983. John Perry.
1984. Wm. Henry Perkin.
1990. Edmund Simpson.
1992. Alfred Vincent Newton.
1999. Alfred Vincent Newton.
2003. Charles Durand Gardissal.
2014. John Fletcher and William Fletcher.
2024. Manoah Bower, Richard Peyton, and Joses Weaver Downing.
2026. Matthias Edward Bowra.
2037. James Apperly.
2048. Jules Mozard.
2057. William Keates.
2058. George Anderson.
2060. William Moberly.
2065. Henry Edward Cradock Monckton and William Clark.
2068. William Smith Mitchell and Charles Martin Ernest Gartner.
2081. Charles Louis Lapito.
2101. Rd. Archibald Brooman.
2144. Richard Peyton.
2373. Jean Alexandre Labat, jun.
2558. Benjamin Goodfellow.
2906. John Aston and John Brant.
3022. William Mill.
3030. James Redgate, Edwin Ellis, and John Cropper.

February 24th.

1982. George Warriner.
1985. William Frederick Bush and William Hewitt.
2004. Charles Durand Gardissal.
2040. Joseph Lamb.
2052. Constant Jouffroy Dumery.
2080. Alfred Vincent Newton.
2186. Louis Jacquemier.
2236. Alfred Vincent Newton.
2414. George Collier.
2446. Jacques Félix Deshayes.
2890. Lodewyk Polak Kerdyk.
3060. Charles Sylvester Rostaing.
47. Louis Antoine Ritterbandt.

PATENTS ON WHICH THE THIRD YEAR'S STAMP DUTY HAS BEEN PAID.

February 16th.

394. Bashley Britten.
416. Ernest Gessner.
431. James Boydell.

February 18th.

403. Harvey Hilliard.
405. William Milner.

February 19th.

401. John Chisholm.
407. John Urie.
408. John Ramsbottom.

February 20th.

396. Nicholas Riggenbach.
432. Thomas Settle and Peter Cooper.
457. Auguste Edouard Loradoux Bellford.
544. William Clay.

February 21st.

436. Charles Walker.

PATENT ON WHICH THE STAMP DUTY OF £100 HAS BEEN PAID.

February 20th.

2497. John Johnson.

WEEKLY LIST OF DESIGNS FOR ARTICLES OF UTILITY REGISTERED.

No. in the Register.	Date of Registration.	Title.	Proprietors' Name.	Address.
3946	Feb. 21.	Fumigating Apparatus for the Cure of Syphilis and Diseases of the Skin	Whicker and Blaise (late Savigny and Co.)	67, St. James's-street.
3947	,, ,,	An Enema or Syringe	Whicker and Blaise	67, St. James's-street.
3948	,, 23.	Waistcoat Shirt	Joshua E. Kellick	7, Ludgate-hill.
3949	,, 25.	Anti-Garotte Cravat	Samuel Whitchall	Nottingham.

Journal of the Society of Arts.

FRIDAY, MARCH 6, 1857.

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THIRTEENTH ORDINARY MEETING.

Wednesday, March 4, 1857.

The Thirteenth Ordinary Meeting of the One Hundred and Third Session was held on Wednesday, the 4th inst., John Hawkshaw, Esq., F.R.S., in the chair.

The following Candidates were balloted for, and duly elected members of the Society:—

Ford, Francis
Ladd, William
Watney, Alfred
Wright, Joseph, jun.

As a Corresponding Member.
Blancheton, Ernest.

The following Institutions have been taken into Union since the last announcement:—

432. Barnard Castle Mechanics' Institution and Literary Society.
433. Free Public Library, St. Margaret and St. John, Westminster.

The following Colonial Institution has been taken into Union since the last announcement:

Antigua Polytechnic Association.

The Paper read was:—

ON APPLIANCES FOR FACILITATING SUBMARINE ENGINEERING AND EXPLORATION.

By Major H. B. Sears.

Part I.—Submarine Engineering.

In the paper which I have prepared for the Society this evening, my purpose will be, not to enter into a dissertation on the various appliances which may heretofore have been used for facilitating subaqueous operations, pertaining to engineering science, but to confine myself more particularly to some of the advantages which experiment has proved may be derived from the use of machinery, constructed on a comparatively new plan, and embodying a more complete application of the natural principles which are the foundations on which rest all appliances for invading (personally,) the dominions of the Water King.

One of the great objects to be derived from our acquaintance with the arts, sciences, and manufactures, is to be enabled to devise means for advancing the progress of these various departments, by throwing new lights on the previously unknown or little understood details of different subjects, connected with each, or, by investigation, to discover new and more economical means of accomplishing the same results, either by a saving of time in the production, or of labour necessary for such production.

All science rests on the foundation of natural principles; and we gain largely, whenever, by a simplification of arrangement, we compel nature to perform man's labour. Water supplies us with steam to drive our ponderous engines which relieve us from arduous toil. It buoys upon its bosom the creations of man's hands, which transport from distant points articles necessary to his subsistence, or the gratification of his luxurious tastes. It is a necessary element. It is an element to be feared. It is full of dangers. It has its delights. It opposes us—it assists us.

In the subject now before you, it opposes obstacles, and renders necessary constructions to obviate its own difficulties; and yet, at the same time, lends a helping hand to assist greatly in conquering itself. You are required to restrain its power by opposing a barrier of rock; it receives the rock and buoys it up, relieving you of one-third of its weight. You desire to submerge a buoyant object; water will then reverse its power and cause it to sink. Being thus of a nature to oppose and yet assist us, and being governed by immutable and well-recognized laws, if those laws be properly enforced, or rather complied with, we may on the one hand restrain its dangerous efforts, and on the other, compel its assistance in ministering to our necessities.

The grand principle that air in an enclosed and inverted vessel, presenting a horizontal surface, will resist the entrance of water into that vessel, provided the air is of the same density as the water, is the principle which first determined the use of the ordinary diving-bell, an instrument now so often used in the preparation of foundations, and the subsequent erection of works under water.

In localities where the "coffer dam" is inadmissible, either through the cost or difficulty of construction, the ordinary suspended bell, pendant from a carriage at the surface, affords the necessary means for adjusting the work in such manner as the engineer may desire. It has been suggested, too, to use the ordinary submarine armour or dress for the adjustment in place of the stones of a work, which have been previously fitted at the surface.

In suggesting a new mode of operations, by which suspensory action may be entirely avoided, it would be impolitic to denounce the methods just mentioned, as being behind the age, since each would undoubtedly have its advocates, who from practical operations would acknowledge the advantages derived by its use, and perhaps look unfavourably on any innovation. No servant can be so humble, that, performing his duties well, though slowly, his services should not be recognized.

The Dover breakwater is an instance of the thorough efficiency of the ordinary bell, yet at the same time by its use the progress of the work has been necessarily slow.

The plan submitted in this paper for accomplishing, as it is confidently asserted, a larger amount of work in a given time, and at a less cost than by present means, is not a mere fancy, brought forward as a theory which cannot stand investigation and the application of practical knowledge to test its merits; but it is boldly placed before you, challenging the most rigid investigation of its qualities to secure the desired advantages of cheapness of construction and saving of time.

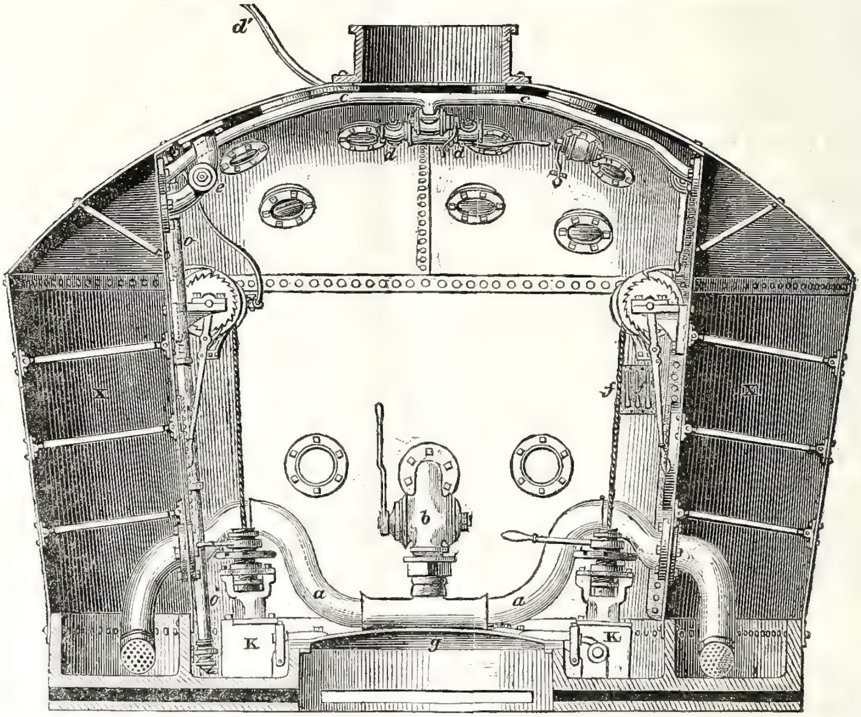
It would be a waste of time to engage your attention in speculation based on the mere working of models (exemplifications of principles), which, by the ingenuity of man, may be made to work with the utmost precision.

The principles involved in the machinery now presented to you, have all been thoroughly and practically tested; not in a single instance, but by months and years of careful investigation, going cautiously forward, taking the suggestions of nature as the guides to avoid the dangers and difficulties which are placed in the path of those who venture to step beyond the apparent bounds, which she herself has raised, to bar man's progress towards her mysteries.

Air and water, the two combined and powerful elements, are both difficult and dangerous to contend with. Water, by its gravity carries us downward; air, by its lightness or buoyancy, carries us upwards or keeps us at the surface; therefore it becomes necessary in any machinery independent of suspension, depending on the variable preponderance of one or the other of these elements, that these powers should be under perfect and complete control. The subtle nature of air requires careful management, and a perfect adaptation of parts to secure its control.

The Nautilus machine, which is presented to you as the instrument for overcoming many of the difficulties inherent to the nature of subaqueous operations, possesses among others the following qualities:—It is entirely independent of suspension; its movements are entirely dependent on the will of those within it, and without reference to those who may be stationed without; it possesses the power of lifting large weights, *per se*, and at the same time is perfectly safe, by common care, in its operations,—this latter the greatest desideratum of all. These advantages must, I think, strike all, as combining those requisites of success which have been always wanting in the present known means for constructing works under water.

SECTIONAL VIEW OF THE NAUTILUS MACHINE.

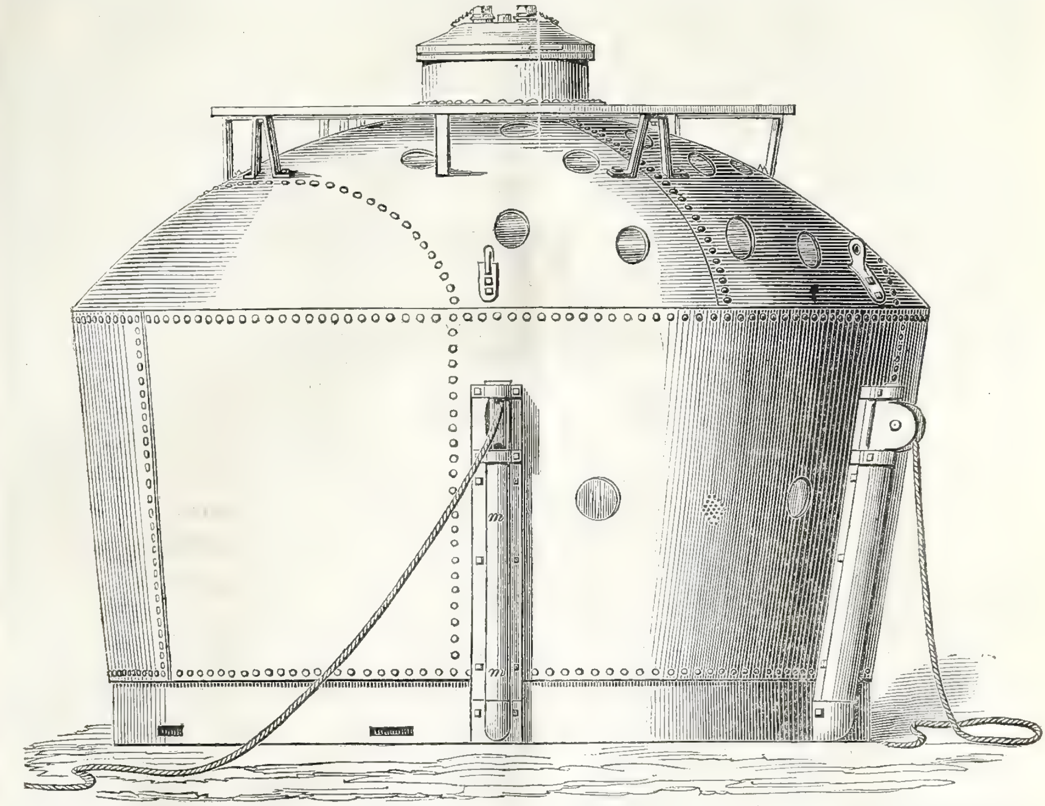


The form of the machine is not arbitrary, but depends entirely on the nature of the work to be performed, adapting itself to the various circumstances attending any given position. By reference to the annexed diagram you will perceive that when at rest, being entirely enclosed, its displacement of water being greater than its own weight, it must float at the surface. Entering through a man-hole at the top (which is closed either from the inside or outside), you descend into the interior of the machine, portions of which are walled off on either side, forming chambers; these chambers are connected at or near the bottom by a pipe *a,a*, which opens by a cock *b*, outwards to the external surrounding water. An opening in the bottom of the machine of variable dimensions is closed by a door or doors, susceptible of being opened or closed at pleasure. The chambers *X,X*, are likewise connected at top by a smaller pipe *c,c*, which opens through the top of the machine, and to which opening is affixed a flexible pipe, with coils of wire spirally enclosed. Branches on this latter pipe *d,d*, allow also communication with the larger or working chamber.

At the surface of the water, placed on a float or vessel for the purpose, is a receiver of variable dimensions, to which is attached at one end a hollow drum or reel to the barrel of which is affixed the other end of the flexible pipe *a*, leading to the top of the Nautilus. At the other end of, and in connection with the receiver is a powerful steam air-condensing pump. This combination represents the Nautilus machine as adapted to engineering work.

As to the *modus operandi.*—The operator, with his assistants, enters the machine through the top, which is then closed. To descend, the water-cock *b* is opened, and the external water flows into the chambers, *X,X*; at the same time a cock, *e*, on a pipe opening from the chambers outwards, is opened, in order that, the air escaping, an uninterrupted flow of water may take place into the chambers. The assumption of weight of water causes a destruction of buoyancy due to displacement by the mass itself, and the Nautilus gradually sinks. As soon as it is fairly under water, in order that the descent may be quiet and without shock, the water cock, *b*, is closed. The receiver at the surface, being previously charged by the air-pump to a density somewhat greater than that of the water at the depth proposed to attain, one of the branch cocks on the pipe, *c,c*, connecting the chambers at top, is opened, and the air rushes into the working chamber, gradually condensing until a density equal to the density of the water without is attained; this is indicated by proper air and water guages, *f,f*. These guages marking equal points, shewing the equilibrium of forces without and within, the covers to the bottom, *g,g*, are removed or raised, and communication is held with the bottom on which the Nautilus is resting. In order to move about in localities where tides or currents do not affect operations, it is only necessary to step out of the bottom of the Nautilus, and placing the hands against its side the operator may move it (by pushing,) in any direction. Where currents or tides, however, have sway, it becomes necessary to depend upon fixed points from which movements may be made in any direction. This is accomplished by placing in the bottom of the Nautilus stuffing boxes of peculiar construction, *k,k*, through which cables may pass over pulleys to the external side, thence

EXTERNAL VIEW OF THE NAUTILUS MACHINE.



up through tubes, (to prevent them from being worn,) to and over oscillating or swinging pulleys placed in the plane of the centre of gravity of the Nautilus, and thence to the points of affixment respectively. The object to be gained by having the swinging pulleys in the plane of the centre of gravity of the mass, is to hold the machine steady and to prevent oscillation. Within the machine, and directly over the above stuffing boxes, are windlasses for winding in the cables. By working these windlasses movement may be effected, and of course the number of these cables will depend on the variable character of the situation to be occupied. Having thus secured the means of descending, communicating with the bottom, and of movement, the next point is to ascend. Weight of water has caused a destruction of buoyancy at first, and consequent sinking; if then, any portion of this water is removed, an upward effort will at once be exerted, exactly proportionate to the weight of water thrown off. The air in the receiver at the surface being constantly maintained at a higher density than that of the water below, if we open the water-cock, *b*, and at the same time open the cock on the top pipe, *c,c*, throwing the condensed air from the receiver above directly on to the surface of the water in the chambers, movement and consequent expulsion of the water must take place, and an upward movement of the machine itself, which will rise to the surface.

It is evident that if, previously to the expulsion of the water, the Nautilus be affixed to any object below, the power exerted on that object will be exactly proportionate to the weight of water expelled, and the power will continue increasing, until there being no further weight to be thrown off, the maximum effect is produced. To apply this power to lifting masses of stone or rock, proper arrangements are affixed to the centre of the opening in the bottom, by which connection can be made with the weight, admitting at the same time the swinging around of the object suspended, so that it may be placed in any required position. In the construction of permanent works, or the movement of objects whose weight is known, or can be estimated, a water or so-called lifting tube is placed on the side of the water chamber which indicates the lifting power exercised by the Nautilus at any moment. The advantage of this guage will be recognised, inasmuch as (without it) the closest attention of the operator working very cautiously, would be necessary to determine when the weight was overcome; by its aid however, the operator boldly throws open all the valves necessary to develop the power of the Nautilus, watching only the guage. The water having reached the proper level indicating the required lifting power, he knows the weight must be overcome or so nearly so, that the valve or the cocks may be at once closed, in order that the movement may take place horizontally. A moment's reflection will show, that if there were not an index of this character, carelessness or inattention on the part of the operator, by leaving the cocks open too long, might develop a power greater than required, and the Nautilus would start suddenly upward. The expansive power of air, acting upon the incompressible fluid water, through the opening in the bottom, gives a momentum, which by successive developments of expansion in the working chamber, is constantly increasing the velocity of the Nautilus upwards, until in any considerable depth of water, the result would be undoubtedly of a very serious character. Take for exemplification the Nautilus in 33 feet of water, the bottom covers removed, and an equilibrium at 15 pounds to the inch existing between the air and the water at the level of the bottom of the machine. Upward movement is communicated the instant the machine rises in the slightest degree, the existing equilibrium is destroyed, and the highly elastic qualities of air assume preponderance, exerting from the rigid surface of water below, an impulsive effort upward in the direction of least resistance. At each successive moment of upward movement, the impelling power increases, owing to the increased disparity between the pressure of air within struggling for escape, and the water without preventing that escape. The machine thus situated becomes a marine rocket (in reality), in which the propelling power is exhausted only when the surface is reached, and a new equilibrium is obtained. It will readily be seen, that were this difficulty not overcome, it would be impossible to govern the Nautilus; for, rising with great velocity to the surface, the machine is carried above its ordinary floatation or water-line; a little more air escapes owing to the diminished resistance, as that level is passed; the recoil, or surging downwards, causes a condensation of the air remaining in the chamber; a portion of the space previously occupied by air is assumed by water, the buoyant power becomes less, the machine settles slightly more by condensation of the air, a larger space is occupied by water, and the Nautilus redescends to the bottom with a constantly accelerating movement, seriously inconveniencing the operators by filling more or less with water according to the depth. For many months the difficulties just enumerated baffled all attempts at control. A weight attached could be lifted, but the instant it was entirely suspended, before the valves could be closed, upward movement was communicated entirely beyond control. This difficulty so fatal, has been overcome by an arrangement of the bottom of the Nautilus, with channels which radiate from the opening in an inclined direction, debouching at the sides of the machine. The moment then, that the air, by its expansion from diminished resistance, or by the introduction from above of a greater volume than can be sustained by the water below, reaches in its downward passage, the level of these chambers, following the direction of least resistance, it passes through these channels and escapes into the surrounding water, without of course affecting the movement of the machine in the least.

I have thus, I trust, shown to you the principles on which the engineering facilities of the nautilus depend.

First, on natural principles, from construction, it must be independent of suspension; and here allow me to bring forcibly to your minds the distinction between a machine which, by its own power, may descend, ascend, move horizontally, lift weights, and transport them by itself (for I assume the operator to be a part of the machine), and the ordinary diving-bell so long used, by which we are enabled to perform the same operations, after much time spent in the preparation of piling, platforms, scaffolding, carriage-way, &c.; and where all necessary movements in the prosecution of the work must be made at the surface through the intervention of signals, which in all cases must be more or less liable to error and misunderstanding.

Supposing the same skilled and careful men to be placed under both conditions, the one time in the ordinary diving-bell, where, when they have determined on the necessary movements to be made, they signal to the surface, and await, first the proper underunderstanding of their wishes, and then subsequently, their execution by those who cannot know precisely the amount of assistance required; or another time, in a machine possessing the capabilities heretofore enumerated, by which the operator, having his work directly before him, watching all the varying circumstances which await his progress, foresees and applies directly his own hand to the work, governing and directing in person those operations which he requires to be performed—certainly the balance must be all in favour of the latter position.

Another thing in the case of the ordinary diving-bell, much time is necessarily consumed in making the necessary preperations to commence the use of the machine; in the other case, when once arrived at the spot required (if in the water), it is ready for immediate service, either to examine the bottom previous to the location, or to commence the foundations at once.

To speak now of that portion of the machinery which remains at the surface:—It is necessary in order to rapid movement, that the supply of air which, acting on the water in the water-chambers, causes the development of the lifting power of the machine, should be in sufficient quantity, so that no delay may arise and that a constant supply may be continually afforded, that there may be no diminution of density in the receiver. It is also necessary that the density of the air in the receiver should at all times be greater than that of the water at the depth to which the machine descends, so that the superior pressure of the air may produce instantaneous movement of the water. A proper proportion of density in a receiver would be about one-third greater than that of the water.

The amount of air continually required for the respiratory purposes of the operators, and also for the purpose of lifting weights, demands a large supply, which is obtained from the steam-condensing pump directly to the receiver. The air-pumps are constructed to throw any required amount of air, each sufficient if required, to work two or three, or even more machines engaged in lifting heavy weights.

There is no heating, owing to the rapid condensation of air at high density. The pumps will work continuously at the highest density, without any perceptible increase of temperature. The economy of working several machines from the same or different receivers, supplied by one pump, is great, as the saving of labour, fuel, wear and tear, in one engine over several, is quite apparent; which economy is due in part to the independence of suspension, allowing the receiver to be placed at any convenient point, even quite distant from the "Nautilus," inasmuch as the pipe may be supported on the surface of the water to the point over the work itself.

Having the powers of air and water then at control, to obviate the use of platforms, trucks, and carriage-way, to lower stones into place, so that they may be properly deposited, you may readily see that a caisson or float, properly arranged with regard to the relative centres of gravity and buoyancy may be moved over or near the work. A load of stone, according to the capacity of the caisson, may be placed upon it. Having this caisson so arranged by divison into chambers, that the water cannot flow from side to side, and constructed with water valves and a connection with the receiver, when the load is properly placed upon it, and the water-valves opened, it will commence to sink. Regulating its descent slowly by the same process as the Nautilus itself, but governed from above, it may be placed in proper position, so that the least possible distance will be required to be passed over, in removing the stones so lowered to their ultimate position of permanency. As the weights are removed, it is obvious that more water will be required to be admitted, in order to retain the caisson at the bottom or on the work. The whole load being removed, to return to the surface, it will be merely necessary to throw from the receiver at the surface a portion of condensed air, to cause it to rise preparatory to its receiving a new load.

The comparative cost of lowering away stone in this manner, as contrasted with the ordinary crane, can hardly be doubted as being favourable to the first method, inasmuch as water is valueless, and the supply of air required to expel that water, as delivered from the condensing pump, can bear but a slight ratio of cost to the labour required to work the cranes. The cost of working a steam-condensing pump sufficient to lower as many stones as would supply two machines, as well as working the machines themselves, would not be more than thirty shillings per diem.

Where water transportation of material is afforded, the caissons themselves may be used as the means of transportation of the stone from the quarry to the site of the work; and then fulfilling their real purpose, of depositing their load in the bottom. A great facility afforded by this process is, that there must always be a supply of material below, in advance of the requirements of the adjusting machines, so that no delay can arise by waiting for materials.

For removal of rocks: the facility that is afforded by going down directly on the bed of the rock, there drilling a series of holes, subsequently charging them, and then exploding them connectedly, would seem to be almost equal to that of the quarry. If large masses be detached, camels inflated, or charged from the receivers may be affixed to them (if too large for the nautilus itself,) and when lifted, towed to the place of deposit, and there left.

Manual labour alone can now be used below water; for steam, our great substitute, cannot be passed through so great a length of hose, and through varying temperature, as is necessary, without condensation; but air does not change its density by passing through great distances, or by any moderate change of temperature.

Having a supply of air at the necessary density for a motive power, it may then be used as such, to propel the necessary drills for boring rocks, by having the proper engines placed within the "Nautilus," and exhausting to the surface. Air being at the same density as steam, and contained within the receivers, which are atmospheric boilers, we may apply the powers of air below, the same as steam at the surface, to the performance of any labour which may be required. There is no difference between air and steam at the same density in their application, except that in the use of air, which is a more subtle fluid than steam, we must exercise additional care in the arrangement of valves, &c. The powers of air which can be developed at the surface in any required amount, are not only applicable to the working of drills for boring rock, but for the sawing off of piles in the preparation of foundations, and for any other purpose where the application of manual labour at comparatively high cost, should if possible, be obviated.

To saw off piles for foundations. If one pile be driven or cut off at the requisite level, the Nautilus, which by construction retains its lower surface in a horizontal position, resting on that pile, and working a saw in the plane of that lower horizontal surface, will of necessity, cut all the piles with which it may be brought in contact in the same plane, then preparing the grillage and planking necessary, when lowered, the Nautilus passing over it can cause it to be securely affixed to the heads of the piles so cut off.

It is manifest that, unless very carefully arranged, any submerged vessel descending rapidly, and striking on any projecting object, would be liable to be thrown from its horizontal position, and to be overturned. Assume that the ordinary bell is descending, and strikes on a projecting or shelving rock, lowering away from the surface; unless the signals are distinctly understood, the chances would be very great of an overturn, resulting in great danger to those within.

In the case where no suspension exists, it becomes necessary to overcome any such tendency to danger, which is done by so harmonizing the centres of buoyancy and of gravity, that under no circumstances can there be but a very slight deflection from a horizontal position. Gravity acts downwards and buoyancy upwards, both in vertical lines. Construct a machine symmetrically, then, with the centres of gravity and buoyancy in the same vertical line, the one near the bottom, on account of weight, the other by peculiarity of construction, as far removed as possible from the first, or as near the top as may be. If, by any means the horizontal position should be destroyed, both forces at once act to restore its original or correct state, gravity downwards, buoyancy upwards; and the power or effective lever which tends to restore it to this horizontal state, will depend on the distance apart of these two centres; therefore I may say, in a properly constructed machine an overturn could never be experienced.

This is a very important subject to be considered, for as there is no chain or rope to cause return to the surface, unless this point were thoroughly guarded there would be no safety at all, since if the Nautilus once received an inclination by the escape of air from the upper side and entrance of water on the lower side, the movement would increase until the whole might be overturned.

It would be unadvisable to say that any given amount of work could be performed by the Nautilus machine in a given time under all circumstances. The power of the machine is positive, and can be certainly relied on; but it may not always be possible to exert that power to its full extent. The length of time required to submerge a first-class machine, lifting six tons, will be two and one-half minutes. Going down slowly, sixty feet per minute may be attained. While the machine is descending, the working chamber may be filled with air of the proper density to resist the entrance of water when the bottom cover is removed. Two minutes are sufficient to unclamp and raise the covers. If the object to be raised be immediately beneath, as soon as the necessary connections can be made, the water cocks are opened and the air is thrown into the water chambers, which can be entirely emptied giving its full lifting capacity of six tons in one-and-a-half minutes.

As to movement horizontally.—Every practical mind can form its own conclusions, as to the rapidity with which such a buoyant mass could be moved through the water. An extract from the report of Mr. Gay, Chief Engineer, U. S. Navy, to the Bureau of Docks and Yards will verify the statements I have made:—

* * * "With the assistance of two experienced persons, I descended in the bell to about twenty feet below the surface of the water. The time occupied to *prepare the bell* and reach the bottom was about *two minutes and thirty seconds*, and about a minute and-a-half to return to the surface. * * *

"One of several blocks of granite, weighing about four tons each, had been previously prepared, and placed on the bottom; the bell was attached to this stone by a 'Lewis.' * * * The time occupied in securing the stone and coming up was about three minutes. * * * I descended with the stone, and, by the aid of two men, transported it several feet laterally, with as much ease as it could have been done were it suspended upon a crane, with the advantage of placing it at any point, or in any desired position."

By skilful and practised manipulation, the powers of any machinery must be developed in a greater degree than by unskilful handling. In acquiring the necessary skill, the necessary length of time required depends much on the complication of the principles involved, or the details by which the results are obtained. In working the Nautilus machine, it is not necessary that the operator should be a scientific man or practical mechanic. By the absolute control of natural elements, the will of the operator as it were, directs and governs the movements of the machine. It is thus the operations of the machine are comparatively inexpensive, since you are required to pay for labour alone, and not to compensate for the genius to comprehend or the skill to control a complicated and delicate instrument.

In any paper description of a new system, of whatever nature it may be, it is impossible to enter into sufficient detail to enable the mind at a single glance, or by a single hearing, to fully comprehend all or even most of the advantages claimed, or of the disadvantages which may be found apparent. In the case however of the system which I have the honour of presenting to you, as applied to submarine engineering, based as it is on purely natural principles, whose partial application heretofore has been attended with a degree of success, certainly of a satisfactory character, the principles laid down I trust, are so easily understood that no one can fail to admit that, certainly *if* the principles in their adaptation in the Nautilus, are governed as represented, the value of the improvements thus made must be of great practical importance to the engineer, by rendering his labours free from much anxiety, and enabling him with confidence to undertake works of peculiar characteristics of position, which, previously considered, would have seemed hazardous.

I cannot flatter myself that in this system, a sovereign panacea has been discovered for all the dangerous symptoms which the engineer meets with in the practice of his profession under water; but I trust that you will admit, that certainly his toils may be rendered lighter, his risks diminished, his expenditures curtailed, his time saved by this process.

A sketch of the construction of a work, by present process, and by the use of the Nautilus may be permitted me. We will suppose the location selected, and that the impracticability of constructing a coffer dam has rendered necessary the use of the ordinary diving bell, which we will also suppose, is already constructed and ready for use.

The first step will be to commence driving the piles upon which the scaffolding is to rest; the scaffolding must then be constructed; the rails must be laid for the passage of the suspending trucks; these trucks must then be placed in position and prepared for use. The bell is then suspended, and we will suppose is ready for work, a considerable amount of time having been expended in this preparation. The bell is raised out of the water, the masons enter, and are lowered away. The descent must be slow, for the weight is great, the chains are stiff, and manual labour is required to overcome these difficulties. Then too, being open at the bottom, lowering away can be effected only as fast as air is supplied by the pumps from above to resist the encroachment of water. The bottom is reached and work is commenced. Movement is necessary—signals are made by blows on the side of the bell, or by the signal cord—at the same time the signal is made and understood at the surface, they commence to move the whole apparatus as directed; the truck at the surface and the bell below move together. It is desired to stop; before doing so, new signals are necessary, movements below being restricted in their efficiency by the proper understanding of signals. You wish to move slightly only, you are carried too far and must return.

In the preparation of foundations where in many cases it is required to move often from point to point in excavating or levelling, this delay becomes important. The foundations, however, are prepared, and the superstructure is commenced. A stone is lowered. The bell by signal is moved over it, and they are connected;—signal to the surface, and the weight of the bell and the stone must be raised together;—signal again to stop hoisting;—signal to move in or out, right or left;—movement is made;—the spot is reached, and the stone must be deposited precisely. The mason says—a little to the right, but he cannot say how many inches and he gets too far; then by successive movements by signal he is accurately placed and lowered away. Then to place another stone he goes through the same process. Mark the time consumed here from want of independence. He sees the stone; he knows it must go there, in that spot, but he cannot himself exercise the power necessary to place it there, but must wait the pleasure and understanding of his directions by others, who of course can only have a general idea of his wishes.

In this way the work is carried on. Other difficulties are however, in the way. The bell suspended below is a pendulum of variable length; if the water be rough at the surface, a swaying or oscillating movement is given to the pendulum, which, in its oscillation however slight, disturbs the horizontal equilibrium between the air and the water, and the air escapes from the upper side, and water enters on the lower side. The pump must then be signalled to work, to restore the volume of air and drive back the water. Oscillation too is dangerous, if at all of a serious character, for the masons may be injured in their limbs if standing on the bottom with the bell suspended. The mason knows too, that if the chain, on which rests his entire hope of safety should break, that the chances are almost certain that his life is lost (numerous instances have attested this latter point); the weight is too great for him to attempt to raise it, and his workshop furnishes him with a metallic coffin. It is evident that no man, however daring he may be, can work with so much will where the chances of danger, however remote, are independent of his own power of governance, as he can where he feels that his own will can at any moment remove him from the possibility of danger.

In reascending to the surface after the completion of duty below, the movement must necessarily be very slow, owing to the same reasons previously enumerated in lowering away. If the chain break while ascending, where would be the labourer's chance?

Enough of the difficulties below. There are still dangers and difficulties at the surface. A storm arises—the work is in an exposed situation—and a portion is weakened, perhaps carried away.

The necessary time must be taken to strengthen or reconstruct the damaged portions. This involves time, it involves expense.

We will now suppose a position, as the removal of a rock, or the construction of a pier-foundation, &c., where it is impracticable to construct platforms and stagings. A boat from which to suspend a bell must be used. Any motion communicated to this boat at the surface, must cause the oscillation below which I have previously spoken of as greatly retarding or entirely putting a stop to operations while such motion is experienced.

Take now the location where the coffer dam is adopted. The first step is to construct the dam, which is a work of time, which is an expense. The dam however being completed and free from leakage, of course the work can then be carried on with great rapidity; but there are difficulties even here; springs in some cases cause difficulties; leaks too, arise. A storm, by weakening a portion of the dam, may cause a delay for repairs or even may demand an entire reconstruction. Of course to the mind of everyone present this is but a suggestion of some of the difficulties which in all cases, in a greater or less degree, attend the construction of this class of works. There is no need of bringing them forward except to place them in contrast with any means which may mitigate their action in whole or in part.

To contrast the action of the Nautilus and to see how far by its action, as previously described, these difficulties may be overcome, I will suppose as in the case of the ordinary bell, the location is decided on. And first, before a decision upon that point is arrived at, you will undoubtedly recognize the facility which the engineer possesses by its use in descending himself, and by accurate survey determining the most favourable position for such location. The nature of the foundation required being determined, its preparation may be at once commenced, since, towing the Nautilus to the spot, your workmen are ready at once to commence work at the same time that, in the other case, they commence the driving piles for the scaffolding. While the scaffolds are being erected, it is but fair to suppose that great progress may have been made by the Nautilus in the construction of the work itself. I have previously shown that, being in position, but a very few moments are required for the workmen to reach the bottom. They then see their work and are ready to prosecute it. No signals for movement are necessary; they wish to move an inch, a foot, a rod, it is done at once; there is no restraining influence, which is not subject to their own will. When their labours are ended they themselves return to the surface, as rapidly or as slowly as they please.

The foundations being prepared to carry on the superstructure, the stones necessary are lowered down by any means, either by cranes or boats for the purpose, or by the caisson method previously described. They will be deposited in a given position and lowered in the order in which they will be required in the work. The chief mason or operator then, knowing the precise position of deposit, which, of course, will be as near the ultimate position of permanency as possible, will so arrange his facilities of movement as to pass in a direct line to and from what may be styled his quarry or place of delivery. He affixes to stone No. 1, and by the power of his machine he suspends it, then moves it, and deposits it. Is it not evident that with the great power of lifting in so rapid a manner, and the movement dependent on his own will, and the subsequent slight movement of adjustment in position, that the whole operation could be performed in very nearly the same time that the truck suspending the ordinary bell, moving by signals, could be placed over the stone ready for lifting? The stone being placed, the nautilus returns to the quarry for No. 2. No delay is experienced, but the action is immediately performed, since all thought necessary is previously exercised. No. 2 follows No. 1, No. 3 No. 2, and so on; the exact measure of juxtaposition having been laid down before the machine is called into requisition, and the memorandum of such detail being in hand. So long as the quarry is supplied, as fast as the various powers of the machine can be called into play the operations must continue uninterrupted.

The mason or workman feels no sensation of danger. If his single connection with the surface which supplies his power, be ruptured, he returns to the surface to make a reconnection. He is restrained for the time being, from exercising any lifting power, but his safety is unimpaired. If a stone break loose its connection, he goes to the surface and there remains until he chooses to descend to make a reconnection. So long as his supply of air is uninterrupted, he cares not for the surface or what is going on there; cut off his supply of air, he knows it and takes his own measures and precaution. While the surface of the water is agitated, unless near the surface, it does not interfere with his operations, since there being no suspension and a sufficient quantity of pipe submerged, or anchored below the surface, no action of the water can impede his movements, as there is no oscillation. The attending floats may be tossed at the pleasure of the waves, so long as they can ride at their anchors or mooring blocks. Should, however, the water become too rough to operate, the Nautilus returns to the surface, and being confined by its anchors, and being a life-boat in itself, no damage can arise by leaving it in position; or the whole afterwards may be towed to a position of safety, and there await the cessation of the preventing cause of operations. The moment those causes have been removed, operations may be resumed at once, since no part of the apparatus or fixtures has been exposed to deterioration or loss.

The same number of men would be required on the Nautilus as in the ordinary bell, at the same prices for labour. The attendant labourers at the surface required in the movement and suspending the ordinary bell would be dispensed with, consequently the cost of producing the same amount of work would be less in the case of the Nautilus. But I trust that the facilities herein demonstrated have shown that the self-acting powers of the Nautilus, directly at the control of the operator, afford the facilities for performing a greater amount of work in a given time than by ordinary means, and as the amount of labour is less, there must be a saving of both time and money. There are other means, such as caissons for constructing portions of masonry which are subsequently placed in positions, upon which I need not expatiate. Their use is confined to particular localities, and they are not susceptible of general application in the construction of submarine works.

In this paper my purpose has been, not to make invidious distinctions between the ordinary diving-bell now in use and the Nautilus, which occupies so prominent a position herein, but to bring forward the merits and defects of the whole system. and place them in contrast with the machinery which has developed powers, which, in the opinion of competent scientific minds, overcome many of the difficulties as well as dangers, which have heretofore enveloped the science of submarine engineering.

DISCUSSION.

Sir John Rennie, F.R.S., in a letter to the Secretary, says:—"I am much obliged to you for a copy of Major Sears's intended paper to-morrow on the "Nautilus Diving Machine," and am sorry that I cannot attend. The diving-bell was first endeavoured to be adapted for engineering operations by Smeaton, at Ramsgate-harbour, in 1788, but he could make very little of it, and, in fact, never used it for building. In 1812 and 1813, my father entirely remodelled the system, and made many improvements, so that he completely rebuilt the East Pier of Ramsgate-harbour outer head in 16 feet at low water, and subsequently employed it at Holyhead, Howth, Kingston, Sheerness, Plymouth Harbours, and other places for the same purpose, and I have done the same, and it is difficult to find a machine which answers its purpose more completely. Diving dresses by Bethell, Dean, Siebe, and others, have been used with great advantage in examining vessels and various other works, and I believe for building at Weymouth and elsewhere, but I do not like them so well as my father's diving-bell and apparatus, detailed plates of which you will find in my works on the Breakwater in Plymouth Sound, and upon British and Foreign harbours.

"As to the Nautilus machine, if I understand rightly, it resembles a good deal an invention claimed as American, also by Fulton, called a submarine diver, which was employed in the late war, 1809-10, for attaching torpedoes to our ships of war, and thus blowing them up at their moorings. It answered tolerably well for a time, but at last the diver in it got confused and was drowned. He could move under water like a fish, and raise and lower the machine by simply letting in water and forcing it out again by condensed air.

"The diving-bell can be used from a floating-stage or vessel very well, and I built Port Patrick Pier-head in 21 feet at low water with it in this manner, in 1827. As for cutting off piles under water, we can do it better by a circular-saw, worked from above, as we did at Sheerness. I hope that you will not consider that I have attempted to depreciate Major Sears's invention, which may be very ingenious, and I wish it every success, but in all discussions we ought to know what has been done before."

Sir Charles Fox said he was sorry he was not aware of the nature of this machine before attending this meeting; otherwise he believed he could have stated a few facts of interest upon this subject. This was another instance in which several ingenious minds had been at work upon the same idea. About two years ago Herr Bauer, a Prussian gentleman, brought under his notice a machine somewhat resembling this in construction; but, as it was defective in some of its details it could not be brought into practical operation, and he so reported to the inventor. About the same time, information reached him that there was a machine at work removing rocks from Cherbourg harbour, the invention of Dr. Payerne, which appeared to contain all the essential points of the Nautilus. This was described to him at the time as a machine in which fourteen men could walk away from the shore under water for half a mile or more, and remove a quantity of rock, remaining without communication with the shore or the surface for twelve hours, and returning to the shore without difficulty or inconvenience. He felt the matter to be so important, that he directed his assistant, Mr. Cochrane, to go to Cherbourg and inspect the operations. He did so, and furnished an elaborate report upon the subject. From this report (he Sir C. Fox), believed there would be no difficulty in constructing a submarine vessel so as to form a most powerful engine for the destruction of the ships of an enemy. An order was immediately given to him by the Government for the construction of such a vessel, which was executed by Mr. John Scott Russell; the termination of the late war, however, prevented the full testing of the terrible powers of that machine, but that it would accomplish all the objects contemplated, experiments made with the apparatus had abundantly proved.

Mr. **Frederick Lawrence** believed this invention was not even so modern as had been stated by Sir Charles Fox, for he found that in 1776 a premium of 20 guineas was given by this Society to a Mr. Spalding, of Edinburgh, for his invention of a diving-bell,* which appeared to possess the main principles of the apparatus now before them. It had two chambers, an upper chamber to contain air, and the other a working chamber, similar to the design of Major Sears. By the introduction of air into the upper chamber, the bell was raised to the surface, and admitting the water in the place of the air, the bell sank again to the bottom. He thought that was similar in principle to the apparatus of Major Sears. He was not aware whether the machine to which he alluded had ever been brought into practical operation. He believed it was no part of the design of the inventor to do away with the chain at the top, which he (Mr. Lawrence) could not but regard as a double measure of precaution in the use of such machines. Major Sears appeared to think that connection with the surface by chains was dangerous; but he must be aware that in submarine operations it was not customary to trust the machine to one chain only, but a safety chain was attached, together with the hose for supplying air to the machine, and in the event of any casualty occurring to the chains, he apprehended the machine would be supplied with sufficient air to afford time for the attaching of another chain to the diving-bell. He thought in Major Sears's invention the great danger would be from the hose breaking, a case very likely to occur in a strong tideway, if a guy-rope should break; and that once broken, it appeared to him that the raising power of the machine was destroyed, and it would then become in reality a metal coffin to the unfortunate persons within it.

Mr. **Heinke** remarked that his experience related to diving dresses rather than to the diving bell itself, and he believed that the diving apparatus had been brought to such a state of perfection that by its aid they could accomplish everything for which the diving bell was designed. One great objection to the apparatus of Major Sears, as far as he could see at present, was its cost, which was a consideration in engineering matters. By means of the recent improvements in diving dresses, a diver could sink or raise himself with the greatest ease by means of valves attached to the helmet, which were perfectly under his control. At the works at Westminster-bridge, a diver met with the accident of breaking the glass of his helmet whilst under water, by striking it against a large spike in one of the piles. He was nearly stunned by the blow, but having the presence of mind to close the valve in front of the helmet, the result followed, as in the case of Major Sears' apparatus—the diver came to the surface. The fracture of the glass operated in the same manner as the opening of a valve. On another occasion, at the same work, it was found that one of the stones of the foundation had not been properly laid on its bed, owing to a quantity of dirt getting beneath it. This was about 11 o'clock at night. By signal from the diver the stone was raised a few inches, so that he could introduce his arm, and having cleared away the dirt, the stone was again lowered into its position. He believed that two or three men furnished with diving dresses could do the same work as was accomplished by means of the diving bell.

Mr. **Fraser** expressed a wish to be informed as to the different dimensions of which this apparatus could be constructed. In a work on which he was at present engaged, viz., removing a bed of concrete in a well at a depth of 90 feet under water, such an apparatus would, no doubt, be of great service, as also in the sinking of wells generally, if it could be made of dimensions sufficiently small for the purpose. With regard to diving dresses, he questioned whether anything had yet been invented in that way which would enable a diver to remove with facility a weight of six tons, which could be effected by Major Sears' apparatus.

Mr. **John Bethell** said his experience had been more with diving-dresses than with diving-bells, but he thought a mistake had been committed in the construction of the old diving-bell. They used to be made very heavy, and were still made of great weight. In his opinion it was unnecessary to construct diving bells of such great weight or strength; all the weight necessary was simply that which was sufficient to sink the machine in the water; they had merely to weight the bell in proportion to the displacement; but with regard to the bell itself, it was unnecessary that it should be of a thick material. Twenty-five years ago he showed that a diving-bell could be made of india-rubber cloth stretched over an iron frame, and it would be just as sound and effective as a bell of cast iron, five inches thick, because the bell had an internal pressure of condensed air to counteract the external presure of the water upon it—the two pressures balancing each other. He also showed, five-and-twenty years ago, that a diving bell might be made of thin sheet iron; and in order to enable the divers to move it when they pleased, there was placed at the top an india-rubber bag, like an air-cushion, which communicated by a pipe with the top of the bell. By the diver turning a cock inside, and allowing a portion of the air to pass into that bag, he caused the bell to rise, and by pulling a string attached to a valve in the top of the cushion the air was let out and the bell sank. Consequently one or two men in the bell, by working the cock, could so regulate the gravity of the machine that they could conduct it to any place they pleased, and then allowing the surplus air from the bag to escape, the bell descended to the required spot. One of the most simple, and at the same time most profitable diving-bells ever worked, was that employed in recovering property from the wreck of the *Thetis* frigate. That bell consisted merely of a ship's iron tank. A hole was knocked in the bottom of the tank, which was weighted with a few pigs of ballast. The fire-engine pumps were employed as air pumps, and there was the diving-bell all ready for use. By that means property to the value of £500,000 was recovered from the *Thetis* frigate. With regard to the apparatus now before them he would remark that it was very ingenious, but exceedingly complicated. The mode of making a diving-bell was very simple indeed. A bell capable of holding six divers could be made for a small sum, and by attaching the air bag in the way he mentioned it could be moved about with facility. Twenty years ago he sent out closed diving dresses; the air was supplied to the helmet by an air pump, and the foul air was driven off through an open pipe leading from the top of the inside of the helmet down to, and discharging its air into, the water just above the diver's right shoulder. The diver had merely to apply his finger to close this pipe, and he came up immediately, and on taking away his finger he sunk again. By these means he could raise himself to any height in the water and to any spot desired, or on to the sides of rocks on which he might have to operate. These dresses had not only been used in Europe, but in many other parts of the world. Two of her Majesty's ships were saved by the use of these dresses. The *Wellesley*, 120 guns, on entering the harbour of Ceylon, in 1838, struck upon the rocks, and would have foundered, but the diving apparatus was rigged out, and in twenty minutes the carpenters repaired the ship thoroughly. The other ship, the *Thunder*, ran upon rocks off the Bahamas, in 1837, and sprang a leak. It was ascertained that there was a diving apparatus at Nassau, belonging to Dr. Lee, who lent his dress to Capt. Owen, and after the damage had been surveyed by the captain and first-lieutenant, in the dress, the carpenter was sent down , and in half-an-hour the leak was repaired. The water was pumped out, the ship got off the bank, and proceeded on her homeward voyage. On reaching home, it was admitted that the damage had been repaired as effectually as if it had been done in one of the naval dockyards. It struck him that engineers had paid less attention to the use of diving dresses and diving apparatus generally, in submarine works, than they deserved. He had endeavoured to interest them in the subject on other occasions by descriptions of those apparatus, but however pleased they might be at the moment, their attention had not been given to the subject. They still retained the ponderous diving-bell, with its costly stages, platforms, and piers, whereas a common ship's boat would serve the purpose with greater safety to the divers. The great—in fact the only—point with regard both to diving-bells and diving apparatus, was to keep up a constant supply of condensed air to the divers, and to have condensing air-pumps and pipes of the best quality. He ought to mention that his diving dresses had been employed in the Bay of Navarino, in recovering guns from the Turkish ships, at a depth of 500 feet, which had been effected without difficulty, and with perfect safety to the driver.

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* Transactions of Society of Arts, Vol. 1, p. 220.

Mr. Lawrence remarked that diving bells were not usually made heavier than was required for sinking them in the water, but the chains must be of a strength sufficient to bear the whole weight of the bell when out of water. In a bell 9 feet by 4 feet by 6 feet, the displacement would be six or seven tons, and such bells would weigh about eight tons, therefore the chains must be able to lift that weight.

Mr. Newton remarked that he had gathered from the paper, that Major Sears proposed to move his machine, when submerged, by the divers pushing it from the outside. If that were the case it involved the use of the diving dress by the persons so employed, and if so he did not see the necessity for a diving bell of this description. For the purpose of moving heavy weights, he thought the caissons ordinarily used in constructing breakwaters, &c., answered every purpose. With regard to the observations of Sir Charles Fox, he (Mr. Newton) would say the case mentioned by him was not the first attempt to blow up enemies' ships. During the American war of Independence, a plan was proposed for blowing up the British ships, which did not suceeed.

The Chairman said that he had had a previous opportunity of inspecting the model upon the table, and he was much pleased with the obvious attention which had been paid to a number of practical details, which all mechanics knew were the desiderata in a work of this kind. All of them who in their younger days had read books upon mechanics, would remember that machines had been proposed for locomotion under water, and no doubt the idea itself was an old one; but, after all, the carrying out was dependent on the successful arrangement of minute details. He must say, with regard to the machine before the meeting, he was much pleased with the evidence of the careful consideration which must have been devoted to bring this machine to perfection. It did not seem calculated to supersede the diving dress. No doubt the facilities offered by those dresses, for moving under water were very great; but the peculiarity of this machine appeared to be the subaqueous motive power that it afforded; in other words, it enabled men to work under water, and move heavy bodies, which could only be lifted by cranes; and to place stones for foundations, with as much accuracy as could be done by a mason working on land. This struck him as one of the principal advantages of the machine. Although a great portion of the work could be performed by the men within the machine, yet there was nothing to prevent men wearing the diving-dresses assisting in the operation outside. He regarded the machine as an exceedingly useful invention. With regard to the observation of Mr. Bethell, that it was difficult to get engineers to pay attention to this subject, he might say that engineers were occupied largely with works above ground, whereas they had not frequent opportunities of building walls below the surface of the water. Submarine engineering operations were comparatively rare, and generally involved great expense. It was not from want of attention to the subject on the part of engineers, but rather from the fact that if they took all the submarine works during the last 10 or 15 years, and added them together, they would form a very insignificant item compared with the other descriptions of works which had occupied the attention of engineers during that period. At the same time, he would say, on behalf of the profession generally, that they were extremely glad to see any improvement in the machinery adapted for the purposes of construction under water.

Sir Charles Fox explained, with regard to Dr. Payerne's apparatus, that when at work they had no communication with the shore, because, when they had to work in heavy weather, it was necessary to get into still water before they could work, and with that machine they could bring away each time four cubic yards of blasted rock, or other material which had to be removed. He would conclude by observing that he entertained a high opinion of the merits of Major Sears' invention, which he thought calculated to answer well the purposes for which it was intended.

Major Sears, in reply to Sir John Rennie, said that he was fully aware of the improvements made by Sir John and his father in the ordinary diving-bell; he would beg, however, to correct him with regard to the similarity of the machine used, not in 1809-10, but, during the revolutionary war between England and the colonies, when the submerged boat, the same as that now used by Dr. Payerne, was adapted to blowing the enemy's fleet out of the water. [A description of the failure of the enterprise was here given by Major Sears.] In reference to cutting off piles, it was a question of economy whether the circular-saw or the arrangement with the Nautilus would be most economical. In answer to Sir Charles Fox, he would say that, although Sir Charles characterised the invention as nothing new, and as combining the same principles as Dr. Payerne's machine, yet, while admitting that "there is nothing new in engineering science," it was nevertheless true that new combinations produced new results, and that Dr. Payerne's principle involved serious disadvantages, inasmuch as, admitting that his boat might lift by the exhaustion of water, one or two stones, yet, when that power had been exerted, it was necessary to return to the surface to get a fresh supply of air. According to the report of Lieutenant Tyler, R.E., it took thirty minutes more to descend in forty feet of water than the ordinary bell, and assuming the latter to occupy ten minutes, the time required to ascend and descend would necessarily be not less than an hour, in which time the Nautilus would place three or four stones. In reply to Mr. Lawrence, Major Sears admitted that, like Spalding's bell there were two chambers, and perhaps, in some cases even more; yet, as Mr. Lawrence remarked, Spalding's bell had never been brought into use. Mr. Spalding certainly used suspensory chains. It was well known that in addition to the suspending chain there was a safety chain, but that chain was liable to become fouled with the suspending chain, and when human life was at stake no precaution should be omitted. It might be possible for the divers to have a sufficient supply of air to enable them to wait for a reconnection, yet, they would of necessity be very uneasy, being dependent on the exertions of others; but, in the Nautilus, even supposing the hose to be broken, the divers had within the machine itself several distinct means of bringing it to the surface. In reply to Mr. Heinke, he would say, it was not intended to supersede submarine armour, but to make use of it as an adjunct. As to cost of apparatus, the extra cost would be more than compensated by the extra labour performed; inasmuch as the Nautilus could do more work than ten or more men in armour. In reply to Mr. Fraser, he would remark, that the dimensions or form not being arbitrary, the Nautilus could be adapted to perform the work required in a well with ninety feet of water; as it might be made from five to ten feet in diameter, and with a lifting power of from one to six tons. In reply to Mr. Bethell, he thought that, theoretically, india-rubber on an inflexible frame might answer, if the relative density could be maintained between the inside and outside; yet, as so many contingencies were apt to arise, it would not do to place trust in so frail a material. As to the weight of the ordinary bell not being necessary, it must be allowed that, when the volume of air had displaced a certain amount of water, it was necessary to compensate by weight for the weight of water displaced, and therefore he must insist that chains, capable of bearing six or seven tons, were required for an ordinary bell. As to the air-bag on the top of the diving-dress, or bell, it was but of little value, as the supply of air was necessarily limited. In answer to Mr. Newton, he would remark that that gentleman had evidently misunderstood his meaning; where there were no currents, the operator stepped through the lower trap of the Nautilus on to the bed of the sea, and, pushing with his hands against the *inside* of the machine, caused it to move. When, however, currents had sway, the cables were employed as described, either holding or moving it as might be required. Men with diving-dresses were not habitually employed inside, although they might be, in particular cases of exploration. Although caissons might be used in some localities, yet they were not applicable in all cases. The United States government had built a caisson at Pensacola, costing some fifteen thousand dollars, which subsequently cost twelve thousand dollars to remove from the channel, where it had overturned. Further, as Mr. Newton could not see the advantages, he would briefly sum them up, premising that any improvement in science or the arts was to be appreciated by its practical utility. The Nautilus possessed the power of commencing the actual work at once, whilst with the ordinary bell extensive preliminary operations were necessary; and it was but fair to suppose that, before such preparations were concluded, by the use of the Nautilus, the work would have considerably advanced. Then the facility of lifting and transporting weights certainly afforded the means of constructing a work in one-third the ordinary time; since, if the ordinary diving bell could do but four hundred cubic feet per day, the Nautilus could do three times as much with the same amount of labour. This he considered, quite a sufficient advantage, in addition to the time gained in the selection of foundations and their subsequent preparation. In a word he would say, that in all his statements he had asked them to take nothing upon trust, for he was prepared to verify every word that had been uttered, by reference to practical operations to be performed by a large machine, shortly to be placed in the Victoria Docks, where he hoped that all who were sceptical as to its merits would practically test its operations.

A vote of thanks was passed to Major Sears.

The Secretary announced that on Wednesday evening next, the 11th inst., a paper by Major H. B. Sears, "on Appliances for Facilitating Submarine Engineering and Exploration," would be read. Part II. Submarine Exploration.

SOULAGES COLLECTION.

The following correspondence has taken place in reference to this collection:—

To the Right Hon. Sir Benjamin Hall, Bart. M.P.

Sir,—We beg leave respectfully to call your attention to an importation recently made into this country, known as the "Soulages Collection," consisting of numerous interesting objects of an artistic and decorative character, illustrative of the tastes and manufactures of Italy in the fifteenth and sixteenth centuries, and extremely valuable as examples for study to artists engaged in the various departments of industry and manufactures to which art is applicable.

It is because we feel strongly the great importance of the formation of a museum or collection of such objects and examples of industrial art, and the immense advantages that would necessarily result in the progress of many branches of our munufactures from providing means and facilities for seeing and studying the artistic works produced in other countries and in former ages, that we venture to trespass on your attention, and request your assistance as the representative of a constituency which comprises a great number of persons engaged in occupations that would be greatly benefited thereby. The want of a collection of this nature has long been seriously felt in the metropolis, and the principle of the formation of such a museum has been recognised by the government, and acted upon by purchases made at the sale of the Bernal Collection, at the Great Exhibition of 1851, and the Universal Exhibition at Paris in 1855. It is a requirement which has been abundantly provided for in Paris by the collection at the Hôtel Cluny, some departments of the Louvre, and the examples and specimens at the Imperial manufactories of Sèvres, Gobelins, and Beauvais, which have exercised a powerful influence upon the education of numerous artists and art-workmen, and greatly contributed to the improvement and extension of many branches of manufacture.

The Soulages Collection would be a most valuable acquisition in the formation of such a museum as we have referred to, and government has now the opportunity of purchasing it upon terms so advantageous, that we consider it would be a neglect of duty not to secure it for the nation. It has been purchased by a number of noblemen, gentlemen, manufacturers, and others engaged in business, whose names are the best guarantee of its value in every sense, whether considered commercially or in an artistic point of view: and having incurred the risk of purchase and conveyance, they have, through the assistance of Lord Stanley of Alderley, the President of the Board of Trade, given many thousands the opportunity of seeing it at Marlborough-house, and now offer it to government for the public benefit at its prime cost of about £13,500, including carriage and all expenses attending its importation.

The most favourable opinions have been expressed regarding it by those most competent to judge of its merits as a collection. As a proof of this we may point to the Report of the Committee appointed to examine it by the Council of the Royal Institute of British Architects, who conclude a long and able notice by saying,—"And they have come to the conclusion, that it would be an irreparable loss of a great opportunity to improve our manufactures, to enlarge the sphere of art application, to increase our commerce, and instruct the public mind, if the government did not accept the offer to sell the whole to the nation at cost price: an offer so nobly made by the disinterested and public-spirited men, who, with singular generosity, and on their own responsibility, have at all risks afforded the opportunity to the country of securing the collection in its entirety."

We need not add any observations of ours to the high authority from which we have borrowed the foregoing extract, but it is necessary that we should state most emphatically, that the gentlemen who have combined to purchase the collection have had in view the sole object of supplying a public want in a purely disinterested manner. No doubt whatever exists in the minds of those most competent to judge, that a much larger sum could be realised by public auction than the cost of this collection. To guard themselves against the slightest imputation of interested motives, it has been expressly agreed that, in the event of a sale by auction, the surplus exceeding the cost and expenses shall be devoted to the encouragement of art.

The study of objects such as are comprised in this collection is as necessary to the education of the art-workman as the study of ancient monuments and edifices is to the architect, the remains of Greek art to the sculptor, or the works of the old masters to the painter.

We therefore hope you will lend the influence of your sound judgment and cultivated taste, and your voice as the representative of a numerous and important constituency, to induce the government to become the purchasers of the Soulages Collection, and thus assist in rendering an important service to the public.

We have the honour to remain,
Sir Benjamin,
Yours most respectfully,

Signed............ {
PETER GRAHAM.
JOHN G. CRACE.
JOHN JACKSON.
EDWARD BOND.

February 18, 1857.

Dear Sir Benjamin,—I have the honour to transmit herewith a letter signed by three of your constituents besides myself.

No other person has been asked to sign, and as the addresses of those who have signed are not added, I think it right to state that Mr. J. G. Crace resides in Wigmore-street, and has done the greater part of the decorative work in the interior of the Houses of Parliament; Mr. John Jackson is of the firm of George Jackson and Sons, Rathbone-place, and is the first man in his way of business in Great Britain; and Mr. Bond is the most active partner in the firm of Gillow and Co., Oxford-street.

Hoping that you will approve of the object we have in view, and lend your able assistance to accomplish it,

I remain, dear Sir Benjamin,
Yours faithfully,
P. GRAHAM.

To the Right Honourable
Sir Benjamin Hall, Bart., &c.

[To this Sir Benjamin Hall has replied, that he would forward the letter to Lord Granville as President of the Council.]

COMPETITIVE EXAMINATION.

(From the *Times*, March 2.)

With respect to the competitive system, the Commissioners make a favourable report of their experience, and, although they admit that the system is as yet in its infancy, they anticipate good results from an extension of its opportunities. For ourselves we regard this question as lying in so very small a compass, and being so transparently plain in character, that we are not disposed to waste arguments upon it. How, in short, is it possible that examiners deputed for the purpose, and employing the best known means without any extraneous bias, should not make a better selection of candidates than patrons open to bias, and employing, as must be presumed, no means at all? Even in the examinations which are not actually competitive there is a good element at work, both for the public service and for the general body of competitors. If out of 100 candidates nominated for appointments 60 or 70 only are pronounced qualified, the rejection of the others at once opens the field of nominations to 30 or 40 more, so that, while the several departments obtain better servants, well qualified candidates obtain a greater number of chances. In all respects, indeed, such a scheme ought to work for the advantage of the country, and not the least of the benefits resulting will be found, we trust, as the Commissioners themselves anticipate, in the general improvement of education which the application of this stimulus will promote.

DEATHS FROM SNAKEBITES IN INDIA.

(From the *Bombay Courier*.)

The number of deaths arising from snakebites in the various zillahs and towns subordinate to this presidency having been brought to the notice of Mr. A. Bettington, Commissioner of Police, by several magistrates, that gentleman addressed a letter to Government to the following effect:—

"I have the honour to report, for the information of government, that the loss of life from the bites of snakes in some districts of this presidency is considerable. In the Dharwar Zillah, for instance, no less than 16 deaths are reported to have occurred within the last four months from this cause. It appears that more deaths are occasioned by snakebites than by tigers. I beg to propose, for the consideration of government, that rewards be offered for the destruction of snakes—eight annas for a snake of any kind, and 12 annas for a cobra; to be paid on the production of the snake forthwith by the Patel and Kolkurnee of the village, who will forward the dead snake (by the village Mhar), with the receipt, to the nearest Mahulkurry or Mamlutudar. It is absolutely necessary that the payment should be prompt, and the reward sufficiently high to induce people to occupy themselves in killing snakes. I purpose to make no exception, because the carpet snake, 'foorsa,' the whip snake, and the cobra (the snakes most commonly met with), are all poisonous, and there can be no exercise of discrimination. In an exceptional case, it would not answer to withdraw payment while ignorant persons, unable to detect the poison-fang and gland, were debating whether the reptile was or was not poisonous. It will be necessary also that the magistrates shall continue to urge and compel the removal of masses of prickly pear from the villages. In many places it does not exist in the form of a boundary hedge, but in patches of greater or less extent, not only occupying ground that might be turned to other purposes, but harbouring reptiles and infecting the air."

In reply the government approved and sanctioned the suggestions of the Commissioner of Police. The people, encouraged by the rewards offered, are occupying themselves most actively in destroying these reptiles. Each day nearly 300 dead snakes are brought in. Mr. Bettington saw an immense number of every description; the most common of all is one called the "foorsa." The civil surgeon of Rutnagherry knows no remedy for the poison of this deadly reptile. Ammonia and other stimulants, if applied in time, are effective antidotes to the poison of the cobra and some other snakes, but are of no avail against the poison of the foorsa. The poison does not act on the nervous system, like that of the cobra, but on the blood alone, which becomes corrupted in a peculiar manner.

GALVANISM AND ITS ECONOMICAL APPLICATION IN THE ARTS.

A committee has been formed in France to examine and report on the merits of the competitors for the prize of 50,000 francs (£2,000 sterling), offered by the decree of the 23rd Feb., 1852, for the discovery of a means of rendering the galvanic battery commercially applicable in the arts either as a source of heat or light, or as a mechanical power or as a chemical or medical agent. The committee consists of MM. Dumas, President; Chevreul, Pelouze, Regnault, Despretz, Rayer, Serres, Charles Dupin, Séquier, Poncelet, Morin, Members of the Academy; Reynaud, director of lighthouses; and Henry Sainte-Clair Deville, of the Normal School.

NAPOLEON I. AND FULTON.

Napoleon has frequently been reproached with having coldly received Fulton and his plan for the application of steam to the purposes of navigation. Marshal Marmont, in his memoirs, says that Buonaparte, who, from his education in the Artillery, had a natural prejudice against novelties, treated Fulton as a quack, and would not listen to him. M. Louis Figuier also, in pp. 258 *et seq.*, the 3rd vol. of his work, writes that Bonaparte refused to place the matter in the hands of the Academy. The following letter from Napoleon, dated from the Camp at Boulogne, 21st July, 1804, and addressed to M. de Champagny, Minister of the Interior, proves the contrary. It is given on the authority of "Cosmos:"—

"I have just read the project of citizen Fulton, an engineer, which you sent me much too late, for it seems capable of *changing the face of the world.* At all events, I desire that you will immediately place the examination of it in the hands of a Committee, composed of members of the Institute, for it is to them that the scientific men of Europe will naturally look for a decision on the question. A great physical truth stands revealed before my eyes. It will be for these gentlemen to see it, and endeavour to avail themselves of it. As soon as the report is made it will be sent to you, and you will forward it to me. Let the decision be given in a week, if possible, for I am impatient to hear it."

INDIAN FIBRES.

A public sale took place at the London Commercial Sale-rooms, Mincing-lane, on Friday, Feb. 6th, of 243 bales of East Indian Fibres, being samples imported by the Honourable East India Company for experiment.

The following is a list of the different kinds sold, and the prices fetched per ton.:—

Oodrah, from £4 10s. to £5 5s.; true Hemp, from the Himalayas, from £26 15s. to £32; Aloe, from £35 to £40 5s.; Putsun Hibiscus, £16; true China grass from Assam, Rhea fibres of various kinds, some partly prepared, from £30 15s. to £46; (Sunnd fibre, (*crotolaria juncea,*) £21 10; true Hemp of the Himalayas, partly prepared in England, from £29 to £30 5s.; tow, £11 5s.; Nettle fibre, £22; Nettle mesakee, £22; Hibiscus, £11 5s. to £25; Gharoo, £10 5s.; Tale Rameh, £40 5s.

Home Correspondence.

INTEROCEANIC RAILWAY.

Sir,—A great objection to any railroad, for connecting the Atlantic with the Pacific Ocean, is that vessels must be unloaded at either extremity, and reloaded again at the other end; but this might be obviated. Sir Samuel Bentham obtained that first-rate men-of-war should for small repairs be taken into dock with all in, and it is now commonly practised. This proves that the hull of a vessel is strong enough to bear the weight of its cargo. Ships of the line built at St. Petersburg, are, in cradles, borne over the shallows formed at the mouth of the Neva, hence it appears that a vessel can be supported in a cradle as in a dock. It seems needless to enter into such particulars as that a ship with its lading might for ordinary traffic rest on a double line of rails.

I am, &c.,
M. S. BENTHAM.

26, Wilton-place, Jan. 30th.

Proceedings of Institutions.

Boston.—The Rev. P. W. Clayden recently delivered a lecture in the Assembly Rooms to the members of the Athenæum, T. Garfit, Esq., in the chair. The subject was—"Habit. 'Use is second Nature.'" The attendance was excellent, the large room being well filled. After a long and interesting exordium the lecturer proceeded to the subject itself, first defining it, then showing its bearing on practical life; tracing the "genesis" of habit in the body, both in its active and passive form, and deducing the law or principle through the operation of which "use" creates "a second nature" in us. Passing on from habits of body, habits of mind came under consideration; and the lecturer showed how the great object of all education was the formation of "good habits of mind," strongly defending "classical" education, as producing a healthy, vigorous, liberal habit of mind. The influence of habit on the opinions, on the social feelings, on the sentiments, and on the passions, was then traced, and a striking contrast drawn between love as a passion of youth, and that love which owes its existence to habit. The lecturer then went on to show the beneficence of the law of habit in its operation, equalising as it did the inequalities of society, reconciling men to their external conditions, and compensating to a great degree the hardships of the world; concluding by a rapid summary of the practical principles the lecturer had developed. J. Noble, Esq., thanked the lecturer, in the name of the meeting, observing that such a lecture must have cost him no ordinary amount of thought and labour. Mr. Clayden, in thanking the audience for their attention, said that on this his first appearance on that platform he had been so well received, he should hope to make his appearance there again. Mr. Clayden has, we believe, intimated, in answer to an inquiry, that he is willing to deliver the lecture gratuitously to any of the other Institutions in the county.

Coupar Angus.—The twenty-second anniversary of the Nautical Improvement Society was held on the evening of Tuesday, the 24th ult., Mr. John Mills occupying the chair. The chairman, in a few introductory remarks, recommended that, instead of the time of the meeting being taken up in listening to set speeches, they should form themselves, for the time being, into a debating club. This suggestion was immediately acted upon, and a spirited discussion, on various subjects, was carried on. It is gratifying to observe a growing desire, on the part of the members of this Society, to extend its usefulness.

Deptford.—The annual meeting of the members of the Mechanics' Literary Institution was recently held, Mr. Crossland in the chair. The secretary, Mr. Alexander Dickson, read a statement of the finances of the Institution, and gave a report of the general progress of the Institution during the past year, which was most encouraging. At the last annual meeting a heavy debt hung over the Institution of upwards of £400; now, the total amount of debts owing scarcely exceeded £70, exclusive of the standing loan on debentures for £1,200, the interest of which was paid yearly.

Eastern Counties Railway and Stratford.—The committee, in presenting the fifth annual report of the proceedings of the Mechanics' Institute, have much pleasure in congratulating the members upon its continued prosperity and the success which has attended its proceedings. The number of members is—20 honorary and 478 ordinary, being an increase of 208 as compared with last year. The circulation of books from the library has considerably increased, there having been nearly 5,000 registered issues during the year, and, during the past year upwards of 300 volumes have been added to it. The lectures and entertainments have been well attended, and have been received with considerable satisfaction, and so large has the attendance been in some instances as to cause the committee to confine the admission to members of the Institution, and to refuse that privilege to the public. The thanks of the members are due to the Directors of the Eastern Counties Railway Company for having kindly granted the use of a train for an excursion to Southend. About 2,100 persons availed themselves of the opportunity thus afforded them. The committee, after considerable discussion, determined upon recommending the reduction of the amount of subscription; and it affords them great satisfaction to state that this reduction has proved eminently successful—in nearly doubling the number of members, and thereby causing a large increase of subscriptions, whereby the committee were enabled to discharge all outstanding liabilities, and can now state that the Institution is entirely free from debt, and that, after the payment of nearly £100 for books, papers, and periodicals, they are enabled to show a balance in hand of upwards of £17. The plan of deducting the subscriptions from the pay sheets fortnightly has been found to work exceedingly well—nearly 300 paying their subscriptions by that mode. The following classes are in operation—Mechanical Drawing, Vocal and Instrumental Music, Writing, and Arithmetic. A French Class is in course of formation.

Greenwich.—The recently-published report of the Society for the Acquisition and Diffusion of Useful Knowledge, shows a manifest progress. There were 682 adult members, and 48 minors, at the close of last quarter, and 200 new members have been elected since the commencement of last year. There has also been more activity in the classes during the past six months than at any previous period. The number of books taken from the library is regularly increasing. During the month of August, 1,878 volumes were read, and during the month of November the number reached 2,475 volumes. The committee present a statement of the income and expenditure for the past six months. The receipts—including members' subscription, sale of catalogues and newspapers, library fines, &c., have been £277 12s. 10d.; and the expenditure for newspapers, books, lectures, printing, salaries, &c., £262 12s. 3d., leaving a balance in the treasurer's hands of £15 0s. 7d.

Hackney.—The ninth annual report of the Hackney Literary and Scientific Institution shows that it is in a flourishing state. From the balance-sheet attached to this report, it will be found that the receipts from all sources during the year have been £374 12s., and the expenditure £273 16s. 11d., and that there is a balance in hand of £19 0s. 8d. The number of members was—at Midsummer, members, 430; ladies' transferable tickets, 124;—at Christmas, members, 411; ladies' transferable tickets, 137. The committee have only been able to expend a sum of about £30 on the library. This they look upon as one of the most popular features of the Institution, and they would have been much gratified to have added more materially to it. The circulation of books during the past year has been on an average 225 per week. The reading-room has been well supplied during the year with papers, and the attendance has been on the whole satisfactory. During the past year the committee provided for the delivery of twenty lectures, and two vocal and instrumental concerts, as follows:—The opening concert in January, conducted by the Distins, and that in September, by Miss Ada Thomson. Sergeant Pearce, on the Crimean Expedition. Mr. Edney, two Musical Entertainments. Mr. Wyld, on John Howard. Dr. Letheby, on the Sweets we Extract. Mr. Parsons (two), one on Thomas Hood and one on the Wits of Queen Anne's Reign. Mr. Salaman (two), one on the History of the Pianoforte and one on Music in connection with the Dance. Mr. Crispe, on the Philosophy of Humbug. Mr. Charles, on the Ludicrous and Lyrical Literature of Love. Mr. G. Dawson (two), one on Peter the Great and one on Martin Luther—his Private Life and Character. Mr. W. Dawson, on the Style and Characteristics of English Glee Writing. Mr. Serle, a Dramatic Reading—the "Merry Wives of Windsor." Mr. Cooper, a Musical Entertainment, entitled, "Sketches of a Tour from Burton-crescent to Balaclava. Dr. Pettigrew on the Arch of Life. Dr. Noad, on the New Induction Apparatus. Mr. Blackburn, on Algeria—its History and Customs. Mr. Fairbairn, a Scottish Musical Entertainment, entitled, "Wanderin' Willie's Wallet."—In addion to these, the following were delivered gratuitously:—Rev. D. Katterns, on Curiosities of Biblical Interpretation and Eccentricities of Preachers. Mr. G. Offor, jun., on the Genius and Writings of Albert Smith. Mr. Wortabet, on Syria and the Holy Land. Mr. Thomas Price, on Sir Thomas More—his Life and Writings. Mr. Grant, on Lord Byron—his Times, Life, and Writings.—The classes have continued their meetings.

Halstead.—The annual meeting of the Literary and Mechanics' Institution was held on the 29th of last December, and a *soirée* in connection with the Institute came off on Tuesday the 3rd of February. About 30 ladies presided over the tea service, and several members offered explanations of diagrams representing locomotion and Australia and Australian life, procured from the Working Man's Educational Union. Some members assisted with the dissolving views, the lantern being kindly supplied by E. Courtauld, Esq., while Sidney Courtauld, Esq., his son, was superintendant. Some photographs from the Society of Arts were exhibited, and much admired. Some members performed vocal and instrumental music. E. W. Harris, Esq., the newly elected president, occupied the chair. The report of the Committee shows that the prosperity of the Institute during the past year is in advance of any that has preceded it. The number of the present members exceeds that of any former period, and the income of the Society, from nearly all sources, has reached a higher point. During the last year, the members have increased to 235, being an increase of 35 over any preceding year, and of 56 over the last year. The receipts and expenditure for the year show a balance in favour of the Institute of £16 13s. 1d., which reduces the debt at the close of last year of £25 0s. 10d. to £8 7s. 9d. While in the year 1851 the total exchange of books and periodicals amounted to only 4,296, and in the year 1855 only reached 6,816, in the past year it has attained an aggregate of 9,698.

Liverpool.—At the annual general meeting of the members of the Liverpool Institute and School of Art, Mount-street, Mr. Thos. Thornely, M.P., the President, occupied the chair, and amongst other gentlemen present were Mr. George Holt, Mr. O. Williams, the Rev. Professor Griffiths, the Rev James Cranbrook, Mr. H. Shimmin, Mr. Haylock, Mr. Murphy, Mr. C. S. Samuell, Mr. Dickson, and Mr. Scott. The secretary read the report, which shows that the Institution has been eminently successful in all its departments. At the close of the year, 2,444 persons were connected with the Institute, as follows, viz.:—Life members, 600; annual members, 161; subscribers to the library and reading-room, 166; lady subscribers, 13; pupils in the day-schools, 838; ditto, evening-schools, 529; ditto ladies' drawing-classes, 33; ditto, ladies' college, 104. The receipts between March 1 and December 31 amounted to £2,797 9s. 11d. The attendance in the evening-school has increased yearly since 1853, and last quarter it was greater than it has ever been since 1849, the number on the respective class-rolls being as follows:—English classes, 94; writing, 154; arithmetic, 163; mathematics, 18; drawing, 141; adult, 60; French, 41; German, 10; Spanish, 10; Latin, 5; dancing, 19—total, 715. Arrangements are in progress, under a committee, composed of members of the Town Council and of the managers of this and the Collegiate Institution, for exhibiting a collection of choice specimens of ornamental work purchased by Government on the breaking up of the Great Exhibition of 1851, the loan of which has been granted for this purpose by the Department of Science and Art. The exhibition will be held in March. The considerable additions that have lately been made to the library have led to so large an accession of subscribers as to satisfy the directors that a liberal expenditure on it will be attended with a corresponding increase of income, in addition to its extending the usefulness of the Institute. The chairman proposed the adoption of the report. He considered that the Institution was so firmly established in public opinion that it was necessary only to keep it in working order to continue to do that great good which had been its result from the beginning up to the present time. Mr. George Holt, in seconding the resolution, said that there never was a period since the establishment of the Institution, in 1825, when its supporters had more reason to be quite satisfied than at present. One thing particularly had always given him great satisfaction, and that was, that they had given a perfect example, upon a large scale, of the successful education of 1,000 or 1,500 young people of both sexes upon non-sectarian principles. The meeting was then addressed by Mr. Samuell, Mr. Murphy, Mr. Haylock, Mr. O. Williams, the Rev. Professor Griffiths, Mr. M'Ilveen, Mr. Dickson, and Mr. Shimmin. After passing the usual votes of thanks, the meeting separated.

Lockwood.—The first Annual Soirèe of the Mechanics Institution, was recently held. The following were among the gentlemen present:—The Rev. T. B. Bensted, Rev. J. Haigh, (St. Pauls); Rev. J. Hughes, of Meltham; Rev. J. Barker, Baptist minister, Lockwood; Rev. J. P. Chown, Bradford; Wm. Crowther, Esq., Gomersall; J. C. Fenton, Esq., Wm. Barker, Esq., T. C. Wrigley, Esq., John Shaw, Esq., James Whitley, Esq. Messrs. W. Crosland, Josiah Berry, W. Wilson, James Shaw, Thomas Haigh, Edgar Fenton, Charles Crosland, Joseph Wrigley, jun., Patrick Martin, W. Taylor, W. Kaye, James Crosland, James Brierley, &c. Bentley Shaw, Esq., the president of the Institution occupied the chair. The Secretary read the report, which stated, that the Lockwood Mechanics' Institution was established in March, 1844, by a few working men, who felt the necessity of self-improvement. But it was not until the year 1855, that the committee, with the assistance of a few gentlemen of the neighbourhood, determined to take the steps which have placed the institution in its present position. Since the removal to the new premises the number of members has more than doubled; and the accommodation is now such that 200 students can be seated comfortably. The committee, aware that the prosperity of the Institution depends chiefly upon the character of the classes and the nature of the class instruction, have paid much attention to this important subject. There are six class-rooms, five of them occupied on Monday evenings, five on Wednesday, and four on Friday, besides two on Saturday; making a total of 16 classes per week. The subjects actually taught are reading, writing, arithmetic, algebra, mensuration, history, geography, grammar, music, free-hand and ornamental drawing. The first and most important classes are the adult. These are attended by young men of from 18 to 35 years of age, who work with much steadiness and determination. The junior classes, too, are well attended, and generally speaking, in a satisfactory state. Number of members for December, 1856—Annual members, 17; weekly, 164; quarterly, 10; presentees, 10; honorary, 11; total males, 212. Females—Weekly, 42; presentees, 3; total females, 45; total males and females, 257. The number of female members at present is 50. The average attendance per night for the last month—three nights a-week—is, males 91, besides 50 at the singing classes. The average attendance per night of females—two nights a week—is 41. The gross attendances for five weeks ending November 29th, is 2,043. There are five paid teachers in the Institution, and an efficient staff of eight volunteers. The library contains 425 vols. The issue for the past year is 2,903. The meeting was then addressed by the President, by the Rev. Joseph Hughes, the Rev. J. Barker, W. Crowther, Esq., the Rev. T. B. Bensted, the Rev. E. Boden, T. P. Crosland, Esq., the Rev. T. P. Chown, J. C. Fenton, Esq., Joseph Wrigley, Esq., and W. C. Kaye.

Salford.—The adjourned examination of the pupils of the boys' day-school in connection with the Mechanics' Institution, was recently held. The subject of the examination was, "The Chemistry of the Air and the Physiology of Respiration." Mr. David Chadwick was elected to the chair, in the absence of Mr. Alderman Agnew, who was unable to attend. Mr. Angell, the teacher, in a few prefatory remarks, defined the objects of education to be:—To teach how to think—to develop the power to think—to discipline the mind into the practice of right-thinking—and to communicate generally useful knowledge. The children proved, in reply to the questions and experiments of the teacher, the existence, properties, and composition of the atmosphere, and the nature of combustion and chemical combination. In physiology, they explained the structure and functions of the chest and the organs contained in it—the nature and uses of the blood, and the changes produced in it by respiration, Mr. Plant proposed, and Mr. A. Somers seconded, a vote of thanks to Mr. Angell, which was carried. Mr. Angell, in acknowledging it, took the opportunity of alluding to the objection sometimes raised, that the teaching of the natural sciences must retard the progress of the pupils in grammar, arithmetic, &c., and stated that it produced exactly the opposite result.—The meeting terminated at ten o'clock. During the evening several airs were played on the pianoforte, by Miss Lawton.

Sidmouth.—An interesting and graphic lecture was delivered at the Institution on Tuesday, Feb. 3, by Charles G. Floyd, Esq., on the subject of "Dr. Johnson." The lecturer commenced by stating that it was not Johnson the philosopher—Johnson the essayist—Johnson the lexicographer—Johnson the LL.D. of two Universities—Johnson the poet—or Johnson the poet's biographer—but Johnson the man, that he proposed to described to them. And after briefly touching upon his true greatness, (despite many external drawbacks,) in this character, he proceeded to illustrate both, by the leading features of his life. The lecturer made some amusing remarks on the shifts and hardships of men of letters of the period, and then passed on to describe the dawning of brighter days; the publication of his famous dictionary, (with some very characteristic definitions contained therein); the celebrated letter to Lord Chesterfield; the pleasant story of his pension from the king; and his first acquaintance with his inseparable companion, James Boswell, best of biographers, vainest and silliest of men! After a tribute to that immortal club over which Johnson presided, and its mighty spirits, Burke, Goldsmith, Gibbon, Garrick, Reynolds, Beauclerc, and others, Mr. Floyd proceeded to illustrate the true grandeur of the man above all the details of littleness that disfigured him. After a series of anecdotes, illustrative of points in his character, and a final tribute to his real greatness, Mr. Floyd concluded his interesting lecture.

Welchpool.—The Committee of the Reading Society, in presenting their report, call attention to important changes that have been effected during the past year. The house originally occupied by the Society was attended with many inconveniences, and it was determined to remove to commodious premises in a central situation, and to engage the services of a paid librarian, who should be regularly in attendance from 7 to 10 every evening. The expenses of removal, and the great additions made to the library during the past year, have occasioned a larger outlay of money than under ordinary circumstances might have been considered prudent; but the present arrangements must so tend to the comfort and convenience of persons frequenting the rooms, that the Committee rely upon a continued increase in the number of subscribers to maintain the Institution in its present state of efficiency, and to justify the purchase of more new books at no very distant period. The library now numbers upwards of a thousand volumes, and the rooms are supplied with three daily and six weekly newspapers, together with most of the popular reviews and serials. The attendance, especially in the evening, and the books taken out, amounting to 881 in the past year, are sufficient proofs that the Institution is appreciated by many in this town, and it is hoped that they will use their influence to induce a still larger number to share in its advantages. In conclusion, the Committee desire to acknowledge the valuable services of their Honorary Secretary, and to convey to him their hearty thanks. The Committee have to acknowledge the receipt of £12 2s. 6d. from the committee of Colonel the Rt. Hon. P. E. Herbert's reception fund for the purchase of books.

WIRKSWORTH.—The report of the committee of the Mechanics' Institution, presented to the General Meeting of the members, Mr. Cantrell, President of the Institution in the chair, shows that the past year has been one of great prosperity, a large increase of members having taken place. The most pleasing feature of the past year was the festival, which will be remembered in Wirksworth and the neighbourhood for many years to come. One of the chief duties of the committee has been the formation of classes for the instruction of the younger members, and they have secured the services of Mr. Henry Marsden, to superintend the classes, which are now established. A number of books and maps have been purchased through the Committee of Council on Education, who have arranged for supplying the books and papers published by them, or their authority, to the Institutions in Union with the Society of Arts. The committee urge the members to qualify themselves by earnest study to become competitors at the Society of Arts Examinations, that their success may honour the Institution to which they belong. The total number of members is 136. The number of books lent during the year is 979. The following gentlemen are the officers for 1857:—*President*—W. Cantrell, Esq.; *Vice-President*—W. Webb, Esq., M.D.; *Trustees*—T. Poyser, Esq., J. Wheatcroft, Esq., W. Weight, Esq., and Mr. Peal; *Treasurer*—Mr. B. Street; *Honorary Secretary*—Mr. G. Marsden; *Librarian*—Mr. J. W. Hall; *Auditors*—Mr. Fryer, Mr. Peal, Mr. J. Hall; *Committee*—Messrs. W. Wright, T. Newton, Jun., Fryer, Surtees, Peal, W. Hall, Savage, Carrington.

PARLIAMENTARY REPORTS.

SESSIONAL PRINTED PAPERS.

Par. No.

Delivered on the 26th February, 1857.

35 (1). Bank of England—Supplementary Return.
52. Duchy of Lancaster—Account.
59. Barracks, &c.—Return.
64. Committee of Selection—1st Report.
Agricultural Produce in Ireland—Return.

Delivered on the 27th of February, 1857.

62. Banks of Issue, &c.—Returns.
67. Extra-parochial Places—Copy of Correspondence.
19. Bills—Petty Sessions (Ireland).
20. ——— Turnpike Trusts Abolition (Ireland).
28. ——— Carlisle Canonries.

Delivered on the 28th February and 2nd March, 1857.

48. Flogging (Navy)—Return.
63. Persia (Expenses of Expedition)—Correspondence.
19 (3). Harbour, &c., Bills (3, Weaver Navigation)—Report of the Board of Trade.
68. Committee of Selection—2nd Report.
30. Bills—Commissioners of Supply (Scotland).
26. ——— Grand Juries (Ireland).
Inclosure Commission—12th Annual Report.
Copyholds—15th Report of Commissioners.
Tithe Commission—Report.

SESSION 1856.

436. Orders of Removal—Return.

Delivered on the 3rd March, 1857.

45. Local Acts (7 and 8, Watchet Harbour and Watchet Harbour Trust; 9, Tilbury, Maldon, and Colchester Railway; 10, Newry, Warrenpoint, and Rostrevor Railway; 11, Midland Great Western Railway of Ireland—Sligo Extension; 12, North Level Drainage; 13, Sunken Vessels Recovery Company)—Admiralty Reports.

MEETINGS FOR THE ENSUING WEEK.

MON. London Inst., 7. Rev. H. Christmas, "On the History and Antiquities of Heraldry; and on some other branches of British Archæology."
Architects, 8. Mr. A. Ashpitel, "On the different theories respecting the Forum at Rome, particularly those of our late Member, the Commendatore Canina."
Geographical, 8½. I. Dr. James Campbell, "Remarks on the Geography and Hydrography of South-west Africa." II. "Notes on the Outlet of the Great Zambesi," from the Journal of the late Capt. Hyde Parker, R.N. III. Mr. Consul Abbott, "Journey in Persia from Shiraz to Darab, and thence westward to Hazeran."
TUES. Royal Inst., 3. Prof. Huxley, "On Physiology—Locomotion."
Syro-Egyptian, 7½. Mr. Samuel Sharpe, "On the Identification of the Egyptian and Persian Kings' names mentioned in the Bible, with those in the Hieroglyphics and Greek Historians."
Civil Engineers, 8. Mr. R. Armstrong, "On High-speed Steam Navigation, and on the Relative Efficiency of the Screw Propeller and Paddle Wheels."
Med. and Chirurg., 8½.
Zoological, 9.
WED. Literary Fund, 2. Anniversary.
London Inst., 3. Mr. E. W. Brayley, "On Mineralogy and Crystallography."
Society of Arts, 8. Major H. B. Sears, "On appliances for facilitating Submarine Engineering and Exploration." Part II. Submarine Exploration.
Geological, 8. I. Dr. H. Falconer, "On the Species of Mastodon and Elephant occurring in the fossil state in England." II. Mr. Bollaert, "On the occurrence of some Mastodon Bones in Chili."
Graphic, 8.
Ethnological, 8½.
Archæological Association, 8½.
THURS. Royal Inst., 3. Prof. Tyndall, "On Sound."
Royal Society Club, 6.
London Inst., 7. Rev. C. Boutell, "On the Church of the Holy Sepulchre."
Antiquaries, 8.
Royal, 8½.
FRI. Astronomical, 8.
Royal Inst., 8½. Prof. Phillips, "Geological Sketches round the Malvern Hills."
SAT. London Institution, 3. Mr. T. A. Malone, "On Experimental Physics, chiefly in Relation to Chemistry."
Royal Institution, 3. Prof. Phillips, "On the Limits of Variation in the State of the Globe—Climate."
Medical, 8.

PATENT LAW AMENDMENT ACT.

APPLICATIONS FOR PATENTS AND PROTECTION ALLOWED.

[*From Gazette, February 27th*, 1857.]

Dated 26th December, 1856.

3064. Armand Jean Baptiste Louis de Marcescheau, Paris—Improvements in the modes of communicating or transmitting motion to propelling apparatus, engines, or machinery.

Dated 20th January, 1857.

160. Frederick Walton, Haughton Dale Mills, Manchester—An improved plastic composition, and in the application of machinery for manufacturing the same.

Dated 11th February, 1857.

397. John Talbot Pitman, 67, Gracechurch-street—Improvements in the mode of making metallic hames for horses. (A communication.)
398. John Talbot Pitman, 67, Gracechurch-street—An improved system of working metallic ores and their products, both metallic and mineral. (A communication.)
400. William Todd and Jacob Todd, Heywood, Lancashire—Certain improvements in power looms for weaving.
401. William George Armstrong, Newcastle-upon-Tyne—Improvements in ordnance.
402. Richard Dugdale Kay, Accrington—An improved method of using or applying a certain colouring matter, either singly or in combination with other colouring matters, to woven or felted fabrics, yarns, or threads, either in the white or dyed state. (A communication.)
403. John Poole, 2, Riley-street, Chelsea—Improvements in safety or other valves, and in mechanical appliances thereto.

404. John Macintosh, Euston-square—Improvements in the manufacture and discharge of projectiles.
405. James Saul Hendy, Essex-street, Strand—Improvements in chimney tops or cowls.
406. George Chappellpotts, New Oxford-street—Improvements in cleansing casks.

Dated 12th February, 1857.

407. Joshua Horton, jun., Brierley-hill, Staffordshire—New or improved machinery for regulating the generation and pressure of steam in steam boilers, and for preventing the explosion of steam boilers.
408. John Langford and Joseph Wilder, Birmingham—A new or improved signal and alarum.
410. Peter Hubert Desvignes, Lewisham—Improvements in machinery for preparing flax, hemp, and other fibrous materials.
411. David Baker, Gisbro' Alum Works, Yorkshire—Improvements in the manufacture of compounds of alumina and of magnesia.
413. William Wilkins, Camberwell—Improvements in flushing apparatus.
414. Isaac Blackburn, Islington, and Robert Blackburn, Edinburgh—Improvements in engines or implements to be employed in agriculture, applicable also to the transporting of heavy bodies to the traction of carriages, and to the conveyance of passengers.
415. Edward Maynard, Brooklyn, Kings, New York—An improvement in calks for the shoes of animals.
416. William Edward Newton, 66, Chancery-lane—Improved machinery for turning articles of irregular forms in the direction of their length. (A communication.)
418. Elias Bowcock, Manchester—Certain improvements in the manufacture of cords to be used in skirts and petticoats.
419. George Gimson, Staley-bridge—Certain improvements in steam engines.
420. Thomas Wingate, Glasgow—Improvements in screw propellers and in adjusting the same.

Dated 13th February, 1857.

421. Charles Wye Williams, Liverpool—Improvements in increasing the draught and promoting the combustion of the fuel in furnaces.
423. William Harry Harrison, Ty Mawr, Ponty Pridd, Glamorganshire—Certain improvements in the machinery or apparatus as at present employed for raising water from mines.
424. William Richardson, 5, Ranelagh-grove, Pimlico—Improvements in the use of iron or any other metal by itself, or in combination with other materials for structural purposes,
425. Frederic Henry Sykes, Cork-street, Piccadilly—An improved apparatus for supplying or feeding boilers with water, applicable to raising and forcing liquids for other purposes.
426. D. A. Lamb, Berwick-upon-Tweed—Improvements in water-closets, and in apparatus connected therewith.
427. William Stettinius Clark, High Holborn—Improvements in machines for grating substances. (A communication.)
428. Walter Sandell Mappin, Birmingham—A new or improved method of constructing doors and windows, for the prevention of burglary, which method of construction is also applicable to other articles where strength is required.
429. Noel Clayton Smith, Churton-street, Pimlico—Improvements in the disc engine.
430. Marmaduke William Hallett, St. George's-road, Eccleston-square—Improvements in apparatus for securing window and other openings in buildings.
431. John Lawson and Stephen Cotton, Leeds—Improvements in machinery for roving, spinning, or twisting flax, cotton, wool, and other fibrous substances.
433. Richard Houchin, junr., Bridport-place, New North-road, Hoxton—Improvements in alarums.
434. Titus Robottom, Atherstone, Warwick—Improvements in locomotive engines chiefly adapted for the purposes of common road or street traction, and the working of agricultural implements.
435. James Cocker, Liverpool—Improvements in, and apparatus for, the manufacture of wire, part of which improvements is applicable to the annealing of other metallic articles.
436. John Williams, Port Madoc, Carnarvon, N.W.—Improvements in apparatus for lowering and stopping anchor chains on board ships, and for other similar purposes.

Dated 14th February, 1857.

437. Andrew Barclay Walker, Liverpool—An improved apparatus for heating fluids.
438. Hamilton Henry Fulton, and Thomas Bodley Etty, 8, Great Queen-street, Westminster—Improvements in the generation and application of steam power for propelling, hauling, driving, or conveying, particularly applicable to farming purposes.
439. Alexander Forrest, Birmingham—Improvements in the construction and ornamentation of belt or band fastenings, and other dress fastenings.
440. John Cruikshank, Princes-end, Tipton, Staffordshire—An improvement or improvements in rolling iron and steel wire.
441. Joseph Firth, Flush Mills, Heckmondwike, Yorkshire, and Joseph Crabtree, Mill-bridge—Improvements in power looms for weaving fancy goods.
442. Archibald Smith, Princes-street—Improvements in machinery for the manufacture of wire rope and other ropes.
443. James Taylor, Upper-street, Islington—Improvements in the preparation or manufacture of manures.
444. Charles Robert Moate, 65, Old Broad-street—Improvements in the permanent way of railways.
445. William Cooke, Cornhill—Improvements in apparatus for ventilating.

Dated 16th February, 1857.

447. William Robinson Jackson, Baltimore, U.S.—An improved railway break.
449. John Crawley, Wood-street, Cheapside—Improvements in collars and wristbands.
451. William Edward Wiley, 34, Great Hampton-street, Birmingham—Improvements in the manufacture of metal pens and penholders.
455. William Clark, 53, Chancery-lane—Improvements in the manufacture of railway chairs. (A communication.)

Dated 17th February, 1857.

457. Henry Green, Liverpool—An improved stove to be heated by gas.
459. John Goodman, 29a, Pall-mall—Improvements in apparatus for holding together letters, music, and other loose sheets. (A communication.)
461. John Bennett, Birmingham—A new or improved joint for fishing rods, the rods or handles of parasols, and for other rods.
463. Emile Alcan, Fore-street—Improvements in machinery for twisting, doubling, and spinning cotton, silk, and other fibrous materials. (A communication.)
465. Jean Baptiste Pascal, Lyons—An improved engine with rotary piston applicable to various purposes.
467. Frederick Burnett Houghton, Upper Gloucester-place, Dorset-square—Improvements in the preparation of materials used in the manufacture of paper.
469. William Young, Queen-street—Improvements in fire-places or stoves.

WEEKLY LIST OF PATENTS SEALED.

February 27th.

1997. Thomas Lees.
2023. John Gregory.
2029. Richard Hill Norris, M.D.
2039. George Cumming Thomas.
2041. Jean Baptiste Marcelin Jobard.
2044. Louis Cornides.
2053. Joel Tanner Hart.
2064. John Benjamin Dancer.
2083. Peter Armand le Comte de Fontainemoreau.
2093. Francis Mitchell Herring.
2100. William Gossage.
2142. Edward Green.
2166. Rd. Archibald Brooman.
2177. William Frederick Spittle.
2225. John George Taylor.
2328. Alfred Vincent Newton.
2343. James Hinks.
2350. William Ward.
2422. John Green.
2476. William Ed. Newton.
2797. John Marshall, junr.
2941. George Collier.
2977. Edwin Heywood.
3056. Jules H. Etienne Mareschal.
3103. Charles Wye Williams.
46. Thomas Holmes.

March 3rd.

2054. Evan Leigh and George Peter Leigh.
2059. John Montagu Hayes.
2061. John Loude Tabberner.
2066. John Johnson.
2072. John Johnston.
2088. Adolphe Gilbert Chalus.
2092. Boniface Sabatier.
2095. William Petrie.
2106. Henry Cooke.
2122. John Gedge.
2126. John Milnes and William Thompson.
2147. Frederic Ducimetière-Monod.
2159. Stanislas Chodzko.
2253. Samuel Calley.
2258. William Horsfall.
2555. Louis Urion.
2590. William Edward Newton.
2594. Louis Urion.
2785. Charles John Lewsey.
2798. Alfred Vincent Newton.

Patents on which the Third Year's Stamp Duty has been Paid.

February 24th.

464. Charles Lamport
555. William Septimus Losh.
585. George Appolt and Charles Appolt.
696. William Wood.

February 26th.

522. Caleb Bloomer.

February 27th.

477. Leontide Agalaee Pallegoix and Alexandre Louis Bellangé.

February 28th.

524. William Vaughan and John Scattergood.
526. Charles Nightingale.

WEEKLY LIST OF DESIGNS FOR ARTICLES OF UTILITY REGISTERED.

No. in the Register.	Date of Registration.	Title.	Proprietors' Name.	Address.
3950	Feb. 26.	Improved Gas Shade and Regulator	Thomas Patstone	Birmingham.
3951	,, ,,	High Pressure Ball-cock	Robert Luke Howard	85, Whitecross-street.
3952	,, 27.	A Clasp..	Joseph Underwood......................	Birmingham.
3953	,, 28.	White's Detached Watch Escapement....	Hill, Son, and White.....	Coventry.
3954	March 3.	Improved double-bound Carpenter's Brace, with octagon compound lever pad	Robert Maples	Sheffield.

Journal of the Society of Arts.

FRIDAY, MARCH 13, 1857.

HONORARY LOCAL SECRETARIES.

The following gentlemen have been appointed honorary local secretaries :—

T. Cooke Ainsworth, Esq., Blackburn.
Rev. Dr. Hume, Liverpool.

FOURTEENTH ORDINARY MEETING.

Wednesday, March 11, 1857.

No meeting of the Society was held this evening, in consequence of the sudden and severe illness of Major H. B. Sears, whose paper "On Appliances for Facilitating Submarine Engineering and Exploration," Part II., "Submarine Exploration," had been announced to be read.

Major Sears was called suddenly to Paris on Friday evening, on urgent business, and it is feared that his illness was aggravated by his hurried journey back, in order to fulfil his engagement with the Society.

DEPUTATION TO LORD PALMERSTON.

A deputation from the Society of Arts had an interview with Lord Palmerston on Wednesday, at Cambridge House, to present the subjoined Memorial in reference to the Society's Examinations. The deputation consisted of the following gentlemen :—

Col. Sykes, F.R.S., *Chairman of the Council.*
The Rev. Dr. Booth, F.R.S., *Treasurer.*
The Right Honourable the Lord Mayor.
William Brown, M.P.
Frederick North, M.P.
Benjamin Oliveira, M.P., F.R.S.
Francis Bennoch.
C. Wentworth Dilke, *Vice-President.*
Rev. William Elliott.
Joseph Glynn, F.R.S.
Peter Graham.
T. Twining, jun., *Vice-President.*
G. Fergusson Wilson, F.R.S.
Thomas Winkworth.
P. Le Neve Foster, *Secretary.*
Charles Critchett, *Assistant-Secretary.*

TO THE RIGHT HONOURABLE LORD VISCOUNT PALMERSTON, FIRST LORD COMMISSIONER of Her MAJESTY'S TREASURY.

The Respectful Memorial of the Council of the Society for the Encouragement of Arts, Manufactures, and Commerce.

The Council of the Society of Arts have learned that a memorial has been presented to your Lordship by the President and Council of the Royal Society, embodying several suggestions as to the most effectual means to promote the study of science, and to advance the general intelligence of the people.

Among the recommendations contained in this memorial, will be found the following :—

1. The establishment of classes in Metropolitan and Provincial Schools, in which the elements of science may be taught on a systematic plan, and that such classes be promoted by government grants in aid of local funds.
2. The establishment of Provincial Lectures, in aid of the above classes.
3. The establishment of Examinations.
4. The formation of Provincial Museums.
5. The distribution and circulation of duplicate specimens from the British Museum and other similar Institutions.
6. The formation of Public Libraries.
7. The more extensive distribution of National Publications, bearing upon the cultivation and advancement of science.
8. The augmentation of the Parliamentary grant for the reward of useful discoveries in Science and attainments in Literature and the Arts, so as to admit of good Service Pensions to men of eminent scientific merit.
9. The augmentation of the annual grant of £1,000 to the Royal Society, whenever special reasons may be assigned for this increase.
10. The formal recognition of the President and Council of the Royal Society as a body authorised to advise the government *inter alia*, on the measures necessary to be adopted for the more general diffusion of a knowledge of physical science among the nation at large.
11. The alternative proposed of substituting a Government Board for the President and Council of the Royal Society.
12. And lastly, that such of the above recommendations as involve an expenditure of public money, might eventually be carried out by appropriating a certain portion of the fees received from Patents; and the memorial concludes with the expression of the opinion of the President and Council of the Royal Society, that no application of these fees could be desired more appropriate than the devotion of a portion of them to the encouragement of abstract science, to which practical art is under so many and such important obligations.

The foregoing recommendations of a body of such high scientific eminence and historical celebrity as the Royal Society of London, formally submitted to your Lordship, receive, with but one or two exceptions, the concurrence of the Society of Arts. Those measures for the improvement of national instruction and the advancement of science which the Royal Society now presses on the notice of her Majesty's government, with the full weight of its high authority, the Society of Arts has for some time past been engaged in submitting to the practical tests of a varied experience. Four years ago (Jan. 19, 1853), a Committee of this Society was appointed by the Council "to inquire and report how far and in what manner the Society of Arts may aid in the promotion of such an education of the people as shall lead to a more general and systematic cultivation of the arts, manufactures, and commerce—the chartered objects of the Society."

This Committee, in its report on Industrial Instruction (presented April 26, 1853), strongly urged on the attention of the Council the value of class teaching, and the importance of its correlative, periodical examination.

"We have received," say the Committee, "a very large amount of decisive testimony in favour of some system of examination for provincial schools in connection with a central body, which should be empowered to grant certificates of proficiency. On this subject the evidence is unanimous and decisive. Several of our correspondents, whose opinions are entitled to the gravest consideration, attach the utmost importance to a practical testing of results by means of examination. Some would go so far as to say, that without some conservative provision of this kind, no organisation, however perfect it may be at first, can long be secured from inefficiency and decay. Amongst others, we would direct attention to the important testimony of Baron Liebig, given at page 46 of this Report."*

To carry into effect the recommendations of this Committee, the Society of Arts did not wait until funds should be placed at its disposal, but, drawing from its own limited resources, had already undertaken to submit to trial measures nearly identical with those which the Royal Society has now deliberately pronounced to be the most judicious that could be adopted. The Society of Arts is now engaged in promoting nearly all the objects commended to the attention of the Government in the Memorial of the President and Council of the Royal Society.

The Society of Arts has associated with it no fewer than 400 of the Mechanics' Institutions of the United Kingdom, and with all it carries on a mutually beneficial correspondence. In these associated institutions, which will probably become the provincial schools of science, it has laboured to establish class teaching and systematic instruction; and the Council have much satisfaction in stating that although the Society's scheme of examinations is practically before the public for little more than twelve months, a marked improvement has already taken place in the character of the class instruction, and in the attendance on the classes at many of the Institutions in Union, while in others, for the first time, class teaching has been established expressly with reference to the Society of Arts Examinations. Stimulated by the hope of obtaining distinction at these examinations, young men are found to attend the classes with remarkable diligence and zeal. This system of periodical examination was successfully inaugurated last June, at the Society's House in the Adelphi, when prizes and certificates were awarded to candidates, some of whom have since obtained official appointments. The Council propose to have the examinations conducted on a more extensive scale this year in London and Huddersfield. Again, this year a special prize fund, upwards of £500, has been subscribed by the promoters of the scheme, and this independently of local contributions. Considerably more than 500 of the most eminent manufacturing and commercial firms, and great employers of labour, whether material or mental, throughout the country, have signed a formal declaration of confidence in the examinations and certificates of the Society of Arts, while of the forty-five examiners who give their unpaid services, and who constitute the Society of Arts Board of Examiners, nineteen are Fellows of the Royal Society. The examinations are not restricted to physical science—they include as well mathematics, physical geography, English history, English literature, modern languages, and drawing. The Society of Arts so far as the funds at its disposal will allow, proposes to develop its scheme of examinations until, taking advantage of railway facilities, the local centres of examination shall be so far multiplied as to bring the advantages of the system easily within the reach of all.

With regard to the distribution of duplicates from the British Museum and other like Institutions, the Society of Arts is now in communication with all the Mechanics' Institutions throughout the United Kingdom, with a view to ascertain their opinions, and to consult their wishes on the subject. It is here proper to state that, at the present time, and for three years past, the Society of Arts has been engaged in circulating works of art among the Institutions associated with the Society.

As to the establishment of provincial lectures, it is one of those educational questions with which the Society of Arts has had to deal for several years past; and it is one on which it has acquired a large amount of accumulated experience. The Society has afforded aid to Institutions and to lecturers alike, by publishing copious lists of lecturers, and by giving other facilities. The Council are, however, of opinion that much success is not to be looked for from metropolitan centralization in this matter.

As regards the establishment of public libraries, the Council believe that Mr. Ewart's Act, slightly amended, so as to give power of appeal to a poll, and its provisions made more generally known, would afford all necessary and just facilities for the purpose.

With respect to the suggestion of the President and Council of the Royal Society, to constitute the President and Council of that body "the recognised advisers of the Government as to the measures to be adopted for the general diffusion of a knowledge of physical science among the nation at large," and the proposal not only "to augment occasionally their annual parliamentary grant of £1,000," but "to place a further sum at their disposal from the patent fees," the Council would observe, that a Committee of the Society of Arts (with Sir Joseph Paxton, its chairman). investigated, during the past year, the subject of the surplus received from patent fees, and came to the conclusion that it ought to be devoted to encourage and aid the progress of invention, on which so intimately depends the advancement of the arts, manufactures, and commerce of the country. The precise mode of its application the Committee did not consider it their duty to point out.

Finally, the Council of the Society of Arts, beg, with much deference, to place before your Lordship and her Majesty's Government the following facts: That the Society, incorporated as "The Society for the Encouragement of Arts, Manufactures, and Commerce," has been established for more than a century; that it has, on public objects alone, expended upwards of £150,000 in that time; that it has been the originator of several societies of great and acknowledged usefulness;* that the germ of the Great Exhibition was developed within its walls; that, for nearly a century past, it has occupied its own hired house in the Adelphi; that it has never been accomodated with apartments provided by the State; that, during the whole long period of the Society's existence, it has neither asked nor received a single shilling of public money for any purpose whatever; and that it has secured, continues to retain, and will labour to deserve, the confidence frankly and freely reposed in it by the Mechanics' Institutions, as also by the commercial and manufacturing classes of the country. They therefore respectfully submit to your Lordship, that the Society of Arts, whether tested by its antecedent, or estimated by its present labours, is the proper body in whose hands it should be left to carry out the work in which it is now actually engaged, embracing those measures so ably indicated by the Royal Society, for the promotion of the scientific and industrial instruction of the country; and they earnestly pray, should it be in the contemplation of her Majesty's Government to make any grant in aid of this desirable object, that assistance may be afforded, commensurate with local contributions, to the classes for systematic instruction in Mechanics' Institutions, but so as not in any way to fetter the free action, or to compromise the independence of those bodies. As the sphere of the Society's operations is now rapidly expanding, since applications to hold periodical examinations, and to award Certificates, have already been received from York, Birmingham, Huddersfield, Leeds, Nottingham, Salisbury, and other provincial centres, they further pray that the Society of Arts may so far be recognised by the government, and placed in such a position as will enable its Council to

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* Report on Industrial Instruction, p. 69.

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* That many of the Scientific and Literary Institutions of our kingdom in various sub-divisions of art and science, have emanated from the said Society."—*Charter of Incorporation of the Society of Arts.*

make satisfactory arrangements to develop its plan for the advancement of systematic instruction, by the help of periodical examination, so as to realise the expressed hope of a large majorityof the Institutions of the kingdom, that the Society of Arts shall be authorised and empowered to carry out, for their benefit, to a national success, the great work of industrial instruction it has deliberately undertaken.

W. H. SYKES, Chairman.
P. LE NEVE FOSTER, Secretary.

NEW LIFE BOAT.

The result of the competition for a prize offered, in the year 1851, by his Grace the Duke of Northumberland, for the best model of a life-boat, was a boat by Mr. Beeching, of Great Yarmouth, which, more than any of the 280 competitors, combined the essential qualities of a life-boat. The Committee of the National Life-boat Institution were, however, not quite satisfied that further efficiency might not be attained, and believing that a boat of a safer and more efficient character might be produced, requested Mr. Peake, Assistant-Master-Shipwright in H.M. Dockyard at Woolwich, who had been a member of the committee appointed by the Duke of Northumberland to decide on the relative merits of the models and drawings competing for his prize, to furnish a design for a life-boat, which might combine as many as possible of the advantages, and have as few as possible of the defects, of the best of the models examined by them. A boat was accordingly designed by Mr. Peake, and, by the authority of the Lords of the Admiralty, was built at the expense of the Government. at Woolwich Dockyard. Some modifications were from time to time made in her, resulting from various experiments, and a trial of her in a gale of wind at Brighton. This boat, together with others on the same design, built at the cost of the Duke of Northumberland, the President of the Institution, was placed on the Northumberland coast in the autumn of 1852. The result of the trials was considered highly satisfactory. The Committee thereupon decided to proceed with the building of other boats on the same plan; and at the present time no less than 23 of these boats are in the possession of the Institution, and stationed on the coasts of the United Kingdom, in addition to 3 which have gone to other countries, and to 10 which have been built for harbour trusts and other bodies on our own coasts.

These boats have, for the most part, been of two sizes, viz., 27 feet and 30 feet in length, with 7½ to 8 feet beam, and rowing from 8 to 12 oars, double-banked, their weight averaging two tons. As, however, boats of this class and size have been found too heavy to be managed in some localities where but few boatmen are to be obtained to launch and man them, some of less beam and weight, rowing 6 oars single-banked, but on the same design in other respects, have been built under the denomination of second-class life-boats, to meet the necessities of such localities.

Of the former class of boats those most recently built by the Institution have so far undergone a further modification as to be reduced somewhat in beam, and to have less height, and greater sharpness of bow and stern, in order to enable them to be rowed with greater speed against a head gale and heavy sea. They are also built of fir, on the diagonal principle of double planking, without timbers; whereas the earlier boats were of elm, and clenched or clinker-built.

The experience of three or four winters' use enables the committee to speak confidently of their success. Several of them have already performed valuable services by saving the lives of shipwrecked persons, and the highest reports have been received respecting them generally from those who have been intrusted with their management. The Committee do not hesitate to pronounce the opinion that, as rowing boats, they are superior to all others. Of their properties as sailing boats they cannot yet speak so positively, as nearly the whole of them are stationed on those parts of the coast where sails are not required. At the same time they have every reason to believe them equally efficient as sailing boats.

The Committee say, "The qualities necessary in a life-boat may be thus summed up:—

1. Extra buoyancy.
2. Self-relief of water.
3. Ballasting.
4. Self-righting.
5. Stability.
6. Speed.
7. Stowage-room.
8. Strength of build."

1. The chief peculiarity of a life-boat, which distinguishes it from all ordinary boats, is its being rendered unsubmergible, by attaching to it, chiefly within board, water-tight air-cases, or fixed water-tight compartments under a deck, or empty casks. This property in one or more of the above forms is common to all life-boats, although some possess it in an inadequate degree, or badly distributed. So long as the necessary space for rowing and working the boat and for the stowage of shipwrecked persons is not interfered with, the amount of this "extra buoyancy" cannot be too great. Especially it is essential that the spare space along the sides of a life-boat, within board, should be entirely occupied by buoyant cases or compartments; as when such is the case, on her shipping a sea, the water, until got rid of, is confined to the midship parts of the boat, where it to a great extent serves as ballast, instead of falling over to the lee side and destroying her equilibrium, as is the case in an ordinary open boat. Barrels or casks, which do not conform in shape to the sides of a boat, but leave large interstices to be occupied by water, are not, therefore, suitable vehicles for providing extra buoyant power; yet, at the present moment, the Liverpool life-boats and some others are provided only with empty casks as buoyant power. The north country or Greathead class of life-boats, of which those at Shields may be considered the type, have their extra buoyancy provided by a water-tight deck at the load water-line, the space between which and the boat's floor is formed into water-tight air chambers; water tight compartments are also built along the sides of the boat, within board, sloped from the gunwale to the deck, thereby effectually excluding any water shipped from settling on one side. The life-boats of Messrs. White, of Cowes, have their buoyancy increased by similar air-compartments along the sides, extending from the gunwale to the boat's floor, but without any enclosed space under a deck. The large sailing life-boats on the Norfolk and Suffolk coast have very wide detached air-boxes or tanks strongly made, to correspond in form with the boat's sides, and extending from the thwarts to the deck. A great amount of extra buoyancy is also in these boats derived from large end air cases built across the bow and stern, and occupying from 3 feet to 4½ feet in length from the stem and stern posts to gunwale height. These cases are chiefly intended to provide self-righting power; but in the event of the boat being stove in, and the space below the deck being filled with water, they alone have sufficient buoyancy to float her. The life-boats built by Mr. Beeching, of Great Yarmouth, and which obtained the Northumberland prize of £100, are in this respect similarly fitted to those of Mr. Peake.

2. The second peculiar characteristic of a life-boat, and which is closely allied to the preceding, although it is not possessed by all life-boats, is the capability of self-discharging in a few seconds any water which may be shipped by the breaking over of a sea, or by a boat being suddenly thrown on her beam-ends. This power is accomplished by means of the water-tight deck at the load water-line and a sufficient number of large open tubes, having their upper orifices at the surface of the deck and

their lower ones at the boat's floor, passing through the space between the deck and the floor, but hermetically closed to it; thus providing an open communication between the interior of the boat and the sea, yet without suffering any leakage into the air-chambers under the deck. In some life-boats these tubes are kept always open; in others, plugs, moveable by hand, and having lanyards or handles, to them, are fitted, which can be withdrawn on water being shipped. In Mr. Peake's boats the tubes are fitted with self-acting valves, which open downwards only, so that they will allow any water shipped to pass downwards, whilst none beyond a trifling leakage can pass upwards through them. It will be at once readily understood that, as the deck is placed at or above the load water-line, any water which is above it will be above the outside level of the sea, with which it has, through the tubes, free communication, and that in obedience to the common law of fluids, which binds them to a uniform level, it must instantly, by its own gravity, descend through the tubes until none remains above the surface of the deck; or, if the boat be very deeply loaded, until the level of the water outside and of that within the boat shall be the same.

This quality of self-relief of water can, of course, only be possessed in perfection in boats with a raised water-tight deck at or above the load-water line. The Norfolk life-boats before alluded to have holes through their *floors*, with plugs attached, through which they will relieve themselves to the outside level of the sea, or through which their crews can let water into them until the common level is obtained, which they accordingly do whenever they go afloat in a gale of wind and heavy sea. They have then, literally, several tons of water on board, but the wide side-cases confine the greater portion of it to the midships of the boat, where it then serves as a loose ballast; the boatmen considering it safest to go off *under sail* with a boat deeply immersed. These boats will therefore only partially relieve themselves of water: they are splendid boats, and their crews have the utmost confidence in them; but we think in this respect they might be improved on. Other life-boats, as, for instance, those at Liverpool, have no relieving holes at all, and, if filled by a sea, their crews have no resource but the primitive, slow, and laborious process of baling with buckets; to do which the oarsmen must take in their oars, and, for a time, disable their boat.

3. A third and important property in a life-boat is ballasting. An ordinary open boat cannot with safety be taken into a heavy sea with metal, or stone, or other ballast having greater specific gravity than water, inasmuch as that if she were upset or filled with a sea she must then infallibly sink. As, however, a life-boat is provided with a large amount of *extra*-buoyant power, she may with impunity have a considerable amount of ballast of any description within her. It may be here observed that ballast of some kind is very contributive to the efficiency of a life-boat. Not only must it add to her stability and thereby to her safety, but in proportion to the heaviness of the sea does weight become necessary to insure speed, its momentum being requisite to withstand the blow of each succeeding breaker, and to carry the boat through it as it strikes her; in the same manner that the fly-wheel of a steam-engine, or other machine, regulates and economises the motive power, and compensates for its irregular or intermittent action. The north country, or Greathead, life-boats have generally no ballast, their great breadth of beam being relied on for stability; but some of them have water let into a tank, constructed for the purpose in the midships of the boat beneath the deck. Beeching's life-boats were also ballasted with water on the same principle; but through a difficulty in securing the filling of the tanks, and in preventing the escape of water from them, serious accidents accompanied with loss of life, occurred to three of those boats. Water-ballast in an inclosed tank, if properly secured, is, we think, better than loose water, such as we have described in the Norfolk boats; but we prefer solid ballast to either, as it can be more advantageously placed, and is more manageable, and less liable to accident. Mr. Peake's life-boats are ballasted with heavy iron keels, and with solid wood and cork ballast stowed under the decks; which latter, in the event of their being stove in and the space under the deck filling with water, would then form extra buoyancy as well, thus serving both purposes.

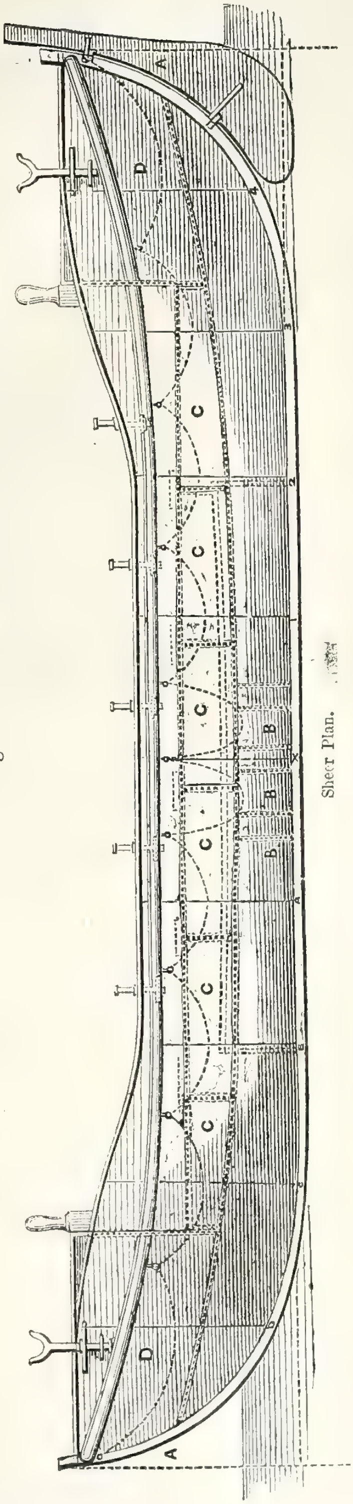
4. A fourth property, that of self-righting if upset, is not a universal principle in life-boats, although it must be considered a most important one, it being only possessed by those of Mr. Peake's and Mr. Beeching's construction. It has been objected to by some boat-builders, from the impression that other more necessary qualities, and especially that of stability, must be sacrificed to obtain it. This, however, is a fallacy; the fact being that the very means which are employed to produce self-righting add to the stability of a boat, and improve her in other respects. That the property of self-righting may be useful is proved by the fact that on the only two occasions when self-righting boats belonging to the National Life-boat Institution have upset, the crews have been enabled to get into them again, and their lives have thereby been saved.

The self-righting power is obtained by the following means:—1st. The boat is built with considerable sheer of gunwale, the bow and stern being from one foot six inches to two feet higher than the sides of the boat at her centre; and the space within the boat at either extremity, to the distance of from 3 to 4½ ft. from the stem and stern posts, to gunwale height, is then enclosed by a sectional bulkhead and a ceiling, and so converted into a water-tight air-chamber, the cubical contents of which, from the thwarts upwards, are sufficient to bear the whole weight of the boat when she is placed in the water in an inverted position, or keel upwards. 2ndly. A heavy iron keel (from 4 to 8 cwt.) is attached, and a nearly equal weight of light wood or cork ballast is stowed betwixt the boat's floor and the deck. No other measures are necessary to be taken in order to effect the self-righting power. When the boat is forcibly placed in the water with her keel upwards, she is floated unsteadily on the two air-chambers at bow and stern, whilst the heavy iron keel and other ballast being then carried above the centre of gravity, an unstable equilibrium is at once effected, and the weight of the iron keel, falling over on one side, immediately restores the boat to her proper position—in other words, she self-rights.

5. A fifth property is lateral stability, commonly called stiffness, being the tendency to preserve an upright position in the water, and proportionate resistance to upsetting. This property is, of course, held in common by all boats, but is more especially essential to life-boats, they being more exposed to the risk of upsetting than any others. As explained under the head of *ballasting*, it is obtained in life-boats by either breadth of beam or by ballast. In Mr. Peake's boats very great stability is obtained by an iron keel and other solid ballast, and by flatness and length of floor, with moderate beam only.

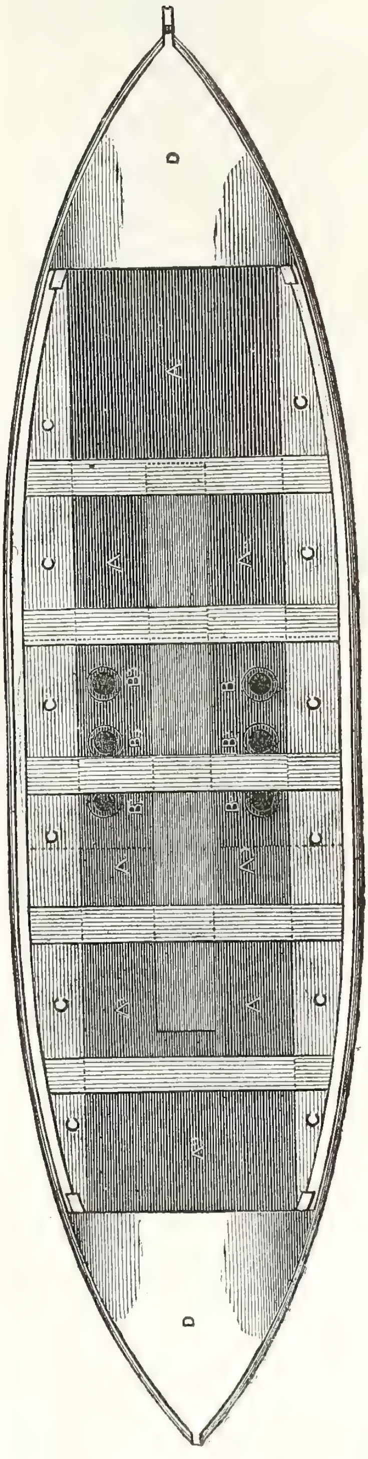
6. A sixth and most essential property is speed. Without speed or capability of being propelled against a heavy sea and head wind, the safest boat in the world would be useless, as she could not be conveyed from the shore to a wreck—frequently against a series of breakers of the most formidable description. As in ordinary boats, propelled by oars, the greatest speed can be obtained by sharpness of bow, and, within certain limits, narrowness of beam. Here, however, the similarity ceases; for whereas great lightness is an advantage in perfectly smooth water and calm weather—as stated under the head of *ballasting*—weight is essential in a heavy sea, and especially a broken sea, in

Fig. 1.



Sheer Plan.

Fig. 2.



Deck Plan.

which the light boat will lose her way or be beaten back by each heavy sea as it strikes her, whilst the heavier boat will by her own inertia carry her way through or over the seas. In a life-boat height of bow and stern is also necessary to prevent the seas from breaking over and filling the boat; for, if sharpness of form be preserved quite up to the gunwale, the height of end will not check a boat's way so much as will a sea breaking into and half-filling her. Speed is not, however, alone necessary to enable a life-boat to force her way through the lines of breaking seas which form an almost impassable barrier between a lee shore and a wreck, it also adds greatly to her safety; for if she lose her way on meeting a very heavy broken sea or roll, she may not only be beaten back by it, but be thrown end over end or broadside to it, and be upset; but if she retain her way, she can be kept bow to the sea until it has passed her, when she will again gather additional speed in readiness to meet with impunity the succeeding wave. Judging, however, from the received reports of Mr. Peake's boats, the committee have no doubt that they are equal in speed and power to any, and superior to most that exist.

7. A seventh quality is stowage-room for passengers. It is of course desirable that a life-boat should have as large an amount as possible of stowage-room, as she might have to proceed to the wreck of an emigrant vessel, or other passenger ship, when it would be important that she should take on board a large number of persons so as to rescue the whole in as few trips as possible. The principal object in view will therefore be to distribute the air-chambers, forming the extra buoyancy of the boat, in such a manner as to occupy no more than can be helped of any space which would be available for the stowage of passengers. Life-boats vary much in this respect. It is a requirement which has been especially studied in Mr. Peake's boats.

8. The eighth and last quality which we have to consider is strength. As a life-boat is liable to be thrown heavily on a beach by the sea, or to be knocked with violence against a vessel's side, or to come in contact with spars or broken wrecks floating in the water, she of necessity must be very strongly built: in this respect, the committee consider that Mr. Peake's boats will bear comparison with any others.

The annexed diagrams show the general form and the nature of the fittings and air-chambers of one of Mr. Peake's life-boats, 30 ft. in length, and 7 ft. 6 in. in breadth.

In figs. 1 and 2, corresponding to the elevation and deck plans, the general exterior form of the boat is seen, showing the sheer of gunwale, length of keel, and rake or slope of stem and stern-posts. The dark dotted lines in fig. 1 also show the position and dimensions of the air-chambers within-board and of the relieving tubes.

A represents the deck.

B, the relieving tubes (6 in. diameter).

C, the side air-cases.

D, the end air-chambers.

In fig. 3, the exterior form of transverse sections at different distances from stem to stern is shown.

Fig. 4 represents a midship transverse section.

A, represents sections of the side air-cases already described.

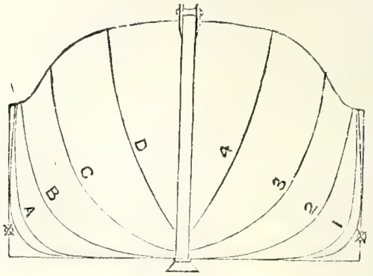
B, the relieving tubes, bored through solid massive chocks of wood, of the same depth as the space between the deck and the boat's floor.

C, spaces beneath the deck, filled up over 6 ft. in length at the midship part of the boat with solid chocks of light wood, or boxes of cork, forming a portion of the ballast, as before described.

D, a section of a tier below the deck, having a moveable hatch or lid, in which the boat's cable is stowed, and into which all leakage beneath the deck is drained through small holes, with valves fixed in them. In some of the later boats, a small draining tier only is placed, having a pump in it, by which any leakage can be pumped out by one of the crew whilst afloat.

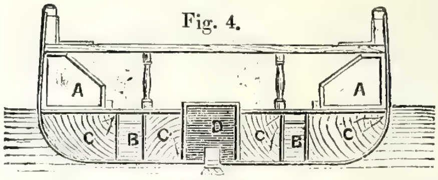
The proportions of one of these boats are as follows:—
Length, 30 ft.
Beam, 7 ft. 6 in.
Depth amidships, 3 ft. 4 in., exclusive of keel.
Ditto, from boat's floor to deck, 1 ft. 3 in.
Ditto, from deck to thwarts, 1 ft. 3 in.
Ditto, from thwarts to gunwale, 10 in.
Length of end-cases (D), 4 ft.
Width of side-cases (C), extreme, 1 ft. 6 in.

Fig. 3.



Body Plan.

Fig. 4.



Midship Section.

The festooned lines in fig. 1 represent exterior life-lines attached round the entire length of the boat, to which persons in the water might cling until they could be got into the boat: the two central life-lines are festooned lower than the others to be used as stirrups, so that a person in the water could more readily, by stepping on them, get into the boat, which is a very difficult operation, for even a strong man to effect, with heavy, wet clothes about him.

DECAY OF GUTTA PERCHA.

The following observations on the state of the underground wires of the British Electric Telegraph Company, are given from two reports of Mr. Edward Highton, to the Directors of that Company:—

Having understood that the wires south of Berkhampstead had failed in many parts, I went there yesterday,* with a view of endeavouring to ascertain the cause of such failure. I selected for examination a district commencing about a mile to the south of Berkhampstead. I selected a length where the wires passed near the roots of oak trees, and then near the roots of ash and Italian poplars, with only one oak tree among them. I found the wires and wooden boxing had failed, and had been renewed for several yards in passing every single oak tree, including the isolated one above-mentioned, and no where else.

I had the earth removed from the wires at various places, and selected, in particular, those spots where the newly replaced wires and boxes joined the old wires and boxes. I found boxing laid down in March last in a state of decomposition—whilst old boxing, put down some two or three years ago, and within seven yards of the same, was perfect. I have found wires perfectly good, and completely rotten within seven yards of each other.

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* September, 1856.

This proved the action to be local. My attention was then directed to the probable cause of the decay.

On opening the first part where the wires were decayed, I observed a remarkable peculiarity in the soil; I detected, at once, a whitish looking plant, resembling the spawn of the mushroom, or some other fungus, pervading the soil and filling every crevice; I found that it had utterly destroyed all the dead roots of the oak and plants in the edge. Its branches spread all over and around the wooden trough, covering it with a whiteness resembling a whitewash. I found wherever the plant touched the gutta percha wires, the gutta percha was rotten. I find that the wooden troughs laid down in March last in the vicinity of this plant, are more rotten than troughs within seven yards of the same (where is no trace of the plant), which have been down since the commencement. I anticipate the whole of the wires which have lately been laid down in those particular parts, will again decay in a short period of time. The breakage that must have taken place, and which is taking place, in spots over a length not exceeding one-third of a mile, is quite enough to stop all telegraphing between Manchester and London.

On my first noticing this peculiar subterraneous plant, I thought it might be the the spawn of a certain fungus. I immediately searched for funguses under those oak trees; I found a yellowish green fungus luxuriantly growing under every single oak without exception, but not one under an ash or other tree.

Whether the vegetable production I found be the spawn of that fungus or not, I cannot say. The facts observed to-day would almost warrant that conclusion.

But, as a botanist, my impression at present is, that it is not so, but that it is an entirely different plant; whatever the plant may be, I cannot believe that any vegetable product, destitute of organic life, can resist its decomposing action.

The plant possesses a powerful odour; after breaking soil a few inches deep, its scent can at once be detected. The presence of the plant and the decay of the wires I found coincident. The absence of the plant and a *most* perfect state of the wires, coincident also. Such are the results of my examinations of yesterday. With the permission of the Board I intend to pursue these investigations.

I now beg to forward a sample of the fungus growing under every oak tree where the wires have failed: I send also a sample of the earth with the decomposing plant therein: its peculiar scent will at once be apparent: I send also a specimen of the decayed boxing in the vicinity of that plant: and I also send a portion of a root acted upon by that plant.

In conclusion, I beg to say all the wires examined by me yesterday, were fully two feet deep.

Since my last report I have carefully examined the spawn-like appearance which I found in the ground surrounding the wires near Berkhampstead.

I have applied to it microscopic power up to 500,000.

The substance presents all the characteristics of the mycellium of a fungus, but of what particular fungus, by name, I have been unable to ascertain.

I have arranged, however, with the Royal Horticultural Society, to have the case, with its concomitant facts, submitted through that Society to the most eminent authority on fungi in Europe.

I have again examined the wires near Berkhampstead. I found the wires passing under two oak trees at a particular spot had in no way been affected. I could find no trace of the fruit of a fungus in the soil around those two trees; around every other oak tree in the neighbourhood, under which the wires had decayed, I found abundance of the fruit of fungi, while around the two trees above mentioned, although in the same neighbourhood there was no fruit at all to be seen, and I was informed by the men who had opened the ground that there had not been any of the spawn-like appearance found there.

On Tuesday last I examined the wires between Warwick and Birmingham; my attention was first directed to a place where the wires passed under a very large oak tree, the stem being sixteen feet in circumference at three feet from the ground, and the branches extending forty-five feet from the stem. The tree is known in the neighbourhood as Old Parr's Oak. The wires under this tree have decayed and have been renewed.

I searched for the fruit of a fungus, and immediately found abundance of it, and apparently of the same identical kind as those under the trees near Berkhampstead where the wires had rotted. I then had the soil renewed and examined the new wires.

I found the wooden lid of the testing box decayed, and covered with both dead and living mycellium of a fungus. I found on the gutta percha of the wires in the two feet which I opened two portions of the mycellium of a fungus, each in area about the size of a penny-piece, and also one under the lid of the test-box.

I have the evidence of two of the Company's workmen, and also of a person living near the spot, that the ground when opened for the renewal of the wires was filled with a substance resembling the spawn of a fungus. I learn from three different witnesses that the ground about a mile from Berkhampstead where there are no trees, but close under a hedge composed of hawthorn, and a shrub commonly called dogwood, presented the same white-like appearance,, and that the same appearance presented itself under every oak tree when the wires had decayed.

There is, therefore, abundant evidence that where this spawn-like appearance is found in the ground, both the gutta percha and the wooden boxing have decayed, while under similar circumstancs the same kind of wires and boxes, when the spawn-like appearance was absent, had not decayed.

Believing, therefore, this whitish appearance to be the mycellium of a fungus, my next inquiry was, if so, what its effect would be upon vegetable matter, such as wood and gutta percha. I referred to a work published only a few weeks ago, and under the article now alluded to, I find reference made to eleven English and foreign works in confirmation of the statement of the author.

The author says:—"The decay of wood is often greatly accelerated by the growth of the mycellium of fungi, which seems to decompose the organic compounds in the wood, in the same manner that yeast does those in organic liquids. A general law prevails througout the fungi, that their nutrition depends exclusively upon the absorption and decomposition of organic compounds, therefore consisting of the performance of the operation of fermentation upon the organic matters upon which they feed."

I am now, however, arranging a series of experiments, which after a short time will enable me to speak positively upon the point.

And next with reference to the decay of gutta percha in iron pipes—

I have as yet examined but two places, viz., one at Knowle, near Birmingham, the other at Winslow, in Buckinghamshire; at Knowle, I found the wires had been renewed, but as the new ones were in good condition, I had little or no data for investigation; suffice it to say, I noticed there a remarkable peculiarity, which I found existing also at Winslow.

At Winslow, I ascertained that there were only 46 yards of iron piping, the wires passing through the rest of the town being in wooden troughs. I found the old wires in a state of decay through the entire lengths of the iron pipings, with the exception of one inch at either end. The wires in the wooden boxing in the immediate neighbourhood, and up to the commencement of the iron pipes, as perfect as they were when first laid down.

In one wire at Winslow the gutta percha was so decayed and cracked that the internal copper wire was visible.

The decay of gutta percha in iron pipes appears at present to me to be produced by a cause entirely different from that under the oak trees alluded to. And although I have already formed my own opinion as to the cause of this decay, I would rather not express that opinion until I find it verified by further observations.

I also examined the wires near Solihull, which had replaced the old wires which had decayed. The soil in which the wires had decayed was a stratum of blue marl, overlying red clay, but as the new wires and boxing were perfect, I had no data for the investigation of the cause of the decay of the previous wires.

During my late experiments, I have not found any difficulty in completely destroying one of the most destructive fungi in Europe, without doing the slightest injury to the plant on which it was growing.

In conclusion, I would observe that there appears to be a number of isolated spots, of a few yards in length, only where the gutta percha has decayed, while at each end of those particular spots, and in the intervening parts, the wires are as perfect as one could possibly wish them to be. I believe all the cases I have examined are attributable to causes which may be obviated by further scientific investigation.

Home Correspondence.

WESTMINSTER CLOCK AND BELL.

SIR,—The tone of Mr. Denison's last letter relieves me from the task of continuing to notice his remarks.

Hitherto I have replied to these letters at length, although from the first the tone has not been inviting; and while he has omitted to adduce proof in support of the assertions made, and resorted to epithet instead, I have given references and proof for the statements advanced. My last reply will, however, appear in the *Mechanics' Magazine* of March 14, and in future the remarks I have yet to make on the Westminster clock and bell will not be lengthened or drawn aside from the subject by any measure of unsupported abuse to which he may descend.

I need only add that much time has been occupied, and great care taken, to render my letters as accurate as possible, and that they do not contain any statement, from the first to the last, in which inaccuracy occurs, even through inadvertence.

E. T. LOSEBY.

5, Fitzroy-terrace, Kentish Town, March 4, 1857.

ELECTRIC TELEGRAPHS.

SIR,—At the French Exposition of 1855, several newly invented instruments were shown, by which two electric messages could be sent at the same time by a single wire, in *contrary* directions. It was not known then that two persons may send from the same, or different stations despatches of various contents at the same time in the same direction by means of one wire, which further improvement has since been invented by Dr. A. Bernstein, in Berlin, who employs for this purpose an instrument named by him "Despatch Distributor."

It is about a year since mention was made of this in some of the newspapers, but the manner of carrying out the invention only became known in May last, when the specification of Dr. Bernstein's patent, (taken out in this country, in the name of F. Duncker, on the 15th November, 1855,) was published, and a small apparatus shown at work to a few gentlemen, but it was taken back to Berlin, not being intended for actual work on long lines of wire. From communications I had a few days ago from Berlin, and from a letter written by Mr. Altgelt, the managing director of the Central Telegraph Station in Berlin, addressed to Dr. Bernstein, and forwarded by the latter to me, it appears that the first experiments made at the central station with such an instrument, were very favourable, and that the trial was repeated some days later on the Berlin-Stettin line by uniting two wires at Stettin, and joining one of the Berlin ends of the wire to two working keys or contact levers, the other end being joined to the Despatch Distributor, which trial was equally successful; and proved, that despatches of various contents sent by two keys could be kept separate and delivered imprinted by the application of Morse's instrument, on two separate slips of paper.

A new instrument has since then been constructed for two messages in one direction, and so arranged that messages in the contrary direction, may also be sent. Mr. Altgelt was instructed by the general Direction of the Prussian telegraphs to examine and try this new apparatus, which was connected on the 10th October with the telegraph wires used in the town and at the central stations. The official report of Mr. Altgelt, was already then so favourable, that the general Direction of the telegraphs determined to have further trials made by connection with the government lines, which have since then repeatedly taken place, and Mr. Altgelt has certified his complete satisfaction, and that the few alterations previously required in the mechanical arrangements, particularly in the construction of the keys having been successfully accomplished by the inventor, the latest experiments have proved that the most correct printing of two messages by Morse's instruments may now be done, when in combination with Dr. Bernstein's Despatch Distributor, so that the adoption of the invention on the Prussian government lines is no longer doubtful, and negociations for the acquisition of it are now in progress.

Dr. Bernstein's invention is not only equally applicable to submarine telegraphs, but in particular suitable for these, and as the advantage of doing double or more work in a given time, and saving the expenses of a number of wires, is very great, there appears to be every probability that the invention will ere long have to be adopted in this country, if not sooner, at any rate when the telegraph lines in other countries are able to despatch two or more messages by Dr. Bernstein's keys, which would arrive in the greatest confusion unless a despatch distributor was here to receive and deliver them separately.

The practicability has now been proved, and persons may convince themselves of the same at the Berlin Central Station, where the apparatus constructed for two messages is worked, but the same principle may be carried out for three, four, or more messages, by a single wire, which is fully explained in the Patent Specification. This, and the drawings belonging thereto, and the certificate of Mr. Altgelt, the managing director of the Central Telegraph Station in Berlin, I have deposited at my leather manufactory, No. 4, Lant-street, Borough, for the inspection of any one interested in telegraphic improvements; and, if further information is desired, letters left there, addressed for this purpose to Dr. Bernstein, or to Mr. Altgelt, for his practical opinion, will be forwarded by me to Berlin, and will, I have no doubt, meet with prompt replies.

I am, &c.

C. A. PRELLER.

No. 5, Aberdeen-terrace, Blackheath, S.E.

Proceedings of Institutions.

LEWES.—The following lectures have been delivered at the Mechanics' Institution during the Autumn Session of 1856:—Sept. 24, Rev. Dr. Booth, F.R.S., "On the most Effectual Means of Promoting the Education of the People;" Oct. 29, Mr. C. Balfour, "Poets of the People;" Oct. 16, Rev. John Barlow, F.R.S., V.P., and

Sec. R.I., "Aluminium the Metal of Clay;" Oct. 23, R. W. Blencowe, Esq., M.A., "On Some of the Moral and Physical Changes that have taken place in the English People;" Nov. 6, Rev. W. de St. Croix, "The Motive Powers of Animals;" Nov. 20, Geo. Dawson, Esq., M.A., "Admiral Sir J. Drake;" Nov. 24, Rev. W. H. Channing, U.S., "The Common Destiny of Great Britain and America;" Dec. 4, Mr. John Cunningham, assisted by Miss Payne and Miss Cole, "Musical Entertainment;" Dec. 18, Mr. Charles Aspull Wells, "Pneumatics."

Royston.—At the Institute, on the 10th Feb. and 3rd March, Robert Hunt, Esq., F.R.S., author of "The Poetry of Science," delivered two lectures, one entitled "Sermons in Stones," the other "Books in the Running Brooks." The former lecture embraced considerations of phenomena determining Rock Formation, &c.—the latter, Water and its physical condition. Mr. Hunt's lectures were most attentively listened to by audiences that appeared to enjoy the lucid expositions of scientific difficulties with which they were favoured by the lecturer.

MEETINGS FOR THE ENSUING WEEK.

Mon. Statistical, 3. Anniversary.
London Inst., 7. Rev. H. Christmas, "On the History and Antiquities of Heraldry; and on some other branches of British Archæology."
Chemical, 8.
Tues. Royal Inst., 3. Prof. Huxley, "On the Principles of Natural History."
Civil Engineers, 8. Discussion upon "High Speed Steam Navigation and the Relative Efficiency of the Screw Propeller and Paddle Wheels."
Linnæan, 8. I. Dr. Cobbold, "On a species of *Medusa* new to Britain." II. Dr. Thomas Thomson, "On the structure of the seeds of *Baringtonia* and *Careya*."
Pathological, 8.
Statistical, 8. Dr. Farr, "On the Pay of the Ministers of the Crown."
Wed. Royal Soc. Lit., 4½.
Society of Arts, 8. Dr. Letheby, "On the Economy of Food."
Thurs. Royal Inst., 3. Prof. Tyndall, "On Sound."
Royal Society Club, 6.
Numismatic, 7.
Antiquaries, 8.
Philological, 8.
Royal, 8½.
Fri. Royal Institution, 8½. Mr. J. W. Brett, "On the Submarine Telegraph."
Sat. Asiatic, 2.
Royal Institution, 3. Prof. Phillips, "On the Limits of Variation in the State of the Globe—Internal Heat."
Royal Botanic, 3¾.
Medical, 8.

PARLIAMENTARY REPORTS.

SESSIONAL PRINTED PAPERS.

Par. No.

Delivered on the 3rd March, 1857.

46. Incumbered Estates Court (Ireland)—Return.
41. East India (Territorial Revenues and Disbursements—Accounts.
29. Bills—Registration of Long Leases (Scotland).
32. ——— Savings Banks.

Delivered on 4th March, 1857.

73. Revenue Departments—Estimates.

Delivered on the 5th March, 1857.

12. Harbour, &c., Bills (4, Elie Harbour; 5, Fraserburgh Harbour; 6, Great Yarmouth Britannia Pier; 7, Lowestoft and Burgh St. Peter Ferry and Roads; 8, Swansea Harbour Trust and Swansea Dock Company; 9, Briton Ferry Docks; 10, Norfolk Estuary; 11, Sunken Vessels' Recovery Company; 12, Swansea Docks; 13, Nene Valley Drainage and Navigation Improvement)—Board of Trade Reports.
69. Railway and Canal Bills—Report of the Board of Trade.
74. Committee of Selection—3rd Report.
75. Railway and Canal Bills—Report of the General Committee—(Groups).
Wrecks and Casualties—Abstract of Returns.

Delivered on the 6th March, 1857.

51. East India (Judicial Establishments, &c.)—Papers.
60. East India (Opium)—Returns.
72. Liverpool Port—Abstract of Receipt and Disbursement of Dock and Light Duties.

Delivered on the 7th and 9th March, 1857.

19. Harbour, &c., Bills (14, North Level Drainage; 15, Wearmouth Bridge, Ferries, and Approaches; 16, Victoria (London) Docks; 17, Watchet Harbour Trust and Watchet Harbour)—Board of Trade Reports.
65. Fishery Board (Scotland)—Copy of Reports.
78. National Gallery—Return.
79. Poor Law Superintendents (Scotland)—Return.
53. Duchy of Cornwall—Account of Receipts and Disbursements.
58. Small Arms—Return.
81. East India Railways—Return.
82. East India (Law Expenses)—Return.
83. Committee of Selection—Special Report.
69. Railway and Canal Bills—Report of the Board of Trade (corrected pages).
4. Bills—Imprisonment for Debt.
34. ——— Grand Juries (Ireland) Act (1836)—Amendment.
37. ——— Income-tax.
Turnpike Trusts (England and Wales)—General Report of the Secretary of State.

Delivered the 5th March, 1857.

409. (Session, 1856). Railways (number and description of persons employed)—Return,

Delivered the 10th March, 1857.

19. Harbour, &c., Bills (18, Ely Tidal Harbour and Railway)—Board of Trade Report.
85. Silver Coinages (Calcutta, &c.)—Return.
90. Committals (Metropolis)—Abstract of Return.
91. Civil Services—A statement of the Estimates.
92. Revenue Departments—A statement of the Estimates.
Railways of the United States—Report by Capt. Douglas Galton.

Delivered the 11th March, 1857.

80. Swansea Cemetery—Correspondence.
84. Public Debt, &c.—Accounts.
96. Exchequer Bills—Account.
36. Bills—Industrial Schools (amended).
38. ——— Ecclesiastical Jurisdiction.
39. ——— Customs Duties.
41. ——— Copyholds, &c., Commission Continuance.
42. ——— Municipal Corporations Act Amendment.

PATENT LAW AMENDMENT ACT.

APPLICATIONS FOR PATENTS AND PROTECTION ALLOWED.

[*From Gazette, March 6th*, 1857.]

Dated 21st November, 1856.

2768. Alexander Clark, Gate-street, Lincoln's-inn-fields—Improvements in the application and construction of revolving window shutters and blinds, and metal window sashes.

Dated 22nd January, 1857.

190. Richard Archibald Brooman, 166, Fleet-street—Improvements in the preparation of oil for lighting, and in lamps, wicks, and chimneys. (A communication.)

Dated 27th January, 1857.

241. David Yoolow Stewart, Glasgow—Improvements in moulding or manufacturing cast-iron pipes.

Dated 12th February, 1857.

409. William Bridges Adams, 1, Adam-street, Adelphi—Improvements in buildings and other structures.

Dated 16th February, 1857.

446. Jean Marie Letestu—Improvements in signals.
448. William Edward Newton, 66, Chancery-lane—Improved machinery for manufacturing nuts and washers. (A communication.)
450. Thomas Newcomb, 10, Cowley-place, Commercial-road—Improvements in machinery for manufacturing nails.
452. Joseph Quick, junr., and Alexander Fraser, Sumner-street, Southwark—Improvements in apparatus for regulating the drawing off and the supply of water and other fluids.
453. Alexander Parkes, 8, Bath-road, Birmingham—Improvements in the manufacture of nails.
454. John Henry Johnson, 47, Lincoln's-inn-fields—Improvements in machinery or apparatus for the manufacture of pasteboard. (A communication.)

Dated 17th February, 1857.

456. Thomas Ball, 3, Hyde-street, Bloomsbury—An improved portable oven for baking bread and other articles of food, in the camp, the field, or the house.
458. Charles Cowper, 20, Southampton buildings, Chancery-lane—Improvements in making drains, and in machinery for that purpose. (A communication.)
460. William Burslem and John Burslem, Cheadle, Cheshire—An improved picker to be used in power looms for weaving.
462. Thomas Withnall, Manchester—Improvements in the manufacture of copper, brass, or other metallic rollers or cylinders.
464. Harby Barber, Belgrave, Leicestershire—Improvements in knitting machinery.
466. Augustus Kaltwasser, 5, Grove-street, Camden-town—An improvement in the action of horizontal pianofortes.
468. Robert Barlow Cooley, Nottingham—An improvement in the manufacture of knitted fabrics.
470. John Naylor, Winterton, near Brigg, Lincolnshire—Improvements in horse hoes.

Dated 18th February, 1857.

471. Charles de Bergue, Dowgate-hill—Certain improvements in marine steam engines.
472. Jacob Green, Philadelphia, U.S.—Improvements in furnaces for burning combustible gases under pressure in the manufacture of glass, iron, and other metals.
473. Hector Christie, Salford—Improvements in finishing and polishing threads and yarns.

474. Robert Best, Birmingham—An improvement or improvements in illumination.
475. John Rylands, Warrington—Improvements in annealing wire.
476. Julien Blanc, 59, Rue St. Louis, Batignolles, near Paris—Improvements in making bread and biscuits. (A communication.)
478. John Moule, Seabright-place, Hackney-road—Improved apparatus to be used for burning pyrotechnic compositions or preparations for producing artificial lights of various colours.
479. David Cheetham, Rochdale—Improvements in machinery or apparatus for preparing, spinning, and reeling cotton and other fibrous materials.
480. Samuel Dyer, Bristol—Certain improvements in ships' windlasses, capstans, bumpkins, gins, and cranes.
481. Louis Léon Faucher, 5, Petite Rue Taranne, Paris—Improvements in apparatus for the manufacture of type and other articles used in letter press printing.

Dated 19th February, 1857.

484. David Lloyd Price, Beaufort, Brecknockshire—Improvements in electrical apparatus for giving signals, and appliances connected therewith.
485. William Halsall and William Hayhurst, Bury, Lancashire—An improved self-acting "temple," to be employed in power looms for weaving.
486. James Abernethy, Westminster—An improved mode of constructing breakwaters in deep water.
487. James Crook, Winckworth-place, Hoxton—Improvements in looms for weaving elastic and other fabrics.
488. Thomas Clayton, Manchester—Improvements in machinery or apparatus for ornamenting and embossing wood, leather, paper, and other similar articles.
489. William Clark, 53, Chancery-lane—Improvements in the manufacture of sheet glass. (A communication.)
490. James Lord, 2, Brierly-street, Rochdale, and William Soothill, Stock-road, Rochdale—Improvements in steam boilers for the more effectual consumption of smoke, whereby a great saving of coal will be effected.
491. Henry Young Darracott Scott, Brompton Barracks, near Chatham—An improved manufacture of cement.
492. Peter Cato and Joseph Betteley, Liverpool—Improvements in the masts, yards, and spars for ships or sailing vessels.

Dated 20th February, 1857.

493. William Oakes, Stockton-on-Tees, Durham—Improvements in the manufacture of iron.
495. Edward Edwards, Abenbury-forge, Wrexham—Improvements in the manufacture of chains for cables and other purposes.
496. John Grist, Islington—Improvements in mash tuns and in apparatus to be employed therewith, which apparatus is also applicable to the heating and keeping up of a continuous circulation of liquids in any vessel to which it may be connected.
497. Richard Archibald Brooman, 166, Fleet-street—Improvements in steam digging apparatus suitable for draining and excavating purposes, parts of which are applicable to reaping. (A communication.)
499. John Combe, Leeds—Improvements in the construction and driving of power looms in the formation of shuttles, and in the winding and arrangements of weft, parts of which improvements are applicable to other purposes.
500. Frederick Charles Jeune, Gresham-street—An improved manufacture of artificial leather.
501. Joseph Glover and John Bold, junr., Liverpool—Improvements consisting of extended uses of photography as applied to dials, tablets, and pictures.
502. Wilhelm Zipser and Johann Peter Klein, Biala, Galicia, Austria—Improved machinery or apparatus to be used in the manufacture of woollen cloth.

Dated 21st February, 1857.

504. Elkan Adler, 133, High Holborn—Improvements in spring bed bottoms, said bottoms being applicable to other descriptions of furniture.
505. Alexander Theophilus Blakely, Tonbridge-wells—Improvements in ordnance.
506. John Elce and Samuel Hartley, Manchester—Improvements in machinery for moulding.
507. Joseph Fielding, Ashton-under-Lyne—An improved apparatus applicable to steam-pipes or cylinders used for heating and drying, which said apparatus may be similarly employed wherever steam is used for such purposes.
508. John Whitehead, Preston—Improvements in boilers.
509. Francis Hay Thomson, Glasgow—Improvements in the manufacture of iron.
510. John Henry Johnson, 47, Lincoln's-inn-fields—Improvements in spinning machines. (A communication.)
511. John Barber, Manchester—Improvements in compound printing maundrills.
512. John Middleton, Hyde, Cheshire, and William Stent, Fairfield, near Manchester—Improvements in railway chairs, and in the joining of rails for railways.
514. John Turner, Syresham, Northamptonshire—Improvements in the process of manufacturing bread, and in the component parts of the same .
514. Victor Touche, 14, Rathbone-place, Oxford-street—Improvements in the manufacture of paper from bass or bast.
515. John Williams, Wigginton, Oxfordshire—Improvements in common road vehicles.
516. Michael Grouse, 549, Oxford-street—An improved apparatus for giving stability to life boats and other boats.
517. George Phillips, Hammersmith—Improvements in stationary cabinets, and in envelopes to be used therewith.
518. William Gossage, Widnes—Improvements in the manufacture of soda and potash.
519. Auguste Quidde and Charles Mayet, Biala, Galicia, Austria—Certain improvements in propelling.

Dated 23rd February, 1857.

521. William Footman, 24, Rodney-street, Pentonville—Further utilizing the illuminating properties of gas, by improvements in burners and shades or reflectors.
523. Joseph James Bannister, Southwark—An improved watch and property protector pocket.
525. Francis Coniliane La Croix, New York—An improvement in reducing and reefing the topsails of vessels.
527. James Edward Shearman, Pimlico—Improvements in saddles and collars for horses and other animals.
529. William Edward Newton, 66, Chancery-lane—An improved furnace for locomotive and other boilers. (A communication.)
531. Jacques Henri Marie Maissiat, Paris—Improvements in dibbling machinery for depositing grain and manure.
533. Laurent Laurot, 22, Rue Fontaine St. George's, Paris—Separating the different solid fatty (acides gras) acids from the liquid fatty ones.
535. John Milnes, Sutton Mill, Kildwick, Yorkshire, and William Thompson, Sutton Mill—Improvements in looms for weaving.

Dated 24th February, 1857.

537. Richard Archibald Brooman, 166, Fleet-street—Improvements in under skirts or petticoats. (A communication.)
539. Joseph Betteley, Liverpool—Improvements in machinery for lifting and working anchors, cables, and other weights on shipboard.
541. Alexander Parkes, Birmingham—Improvements in separating tin from tin-plate scrap, and tin or zinc from other surfaces of iron.
543. John Henry Johnson, 47, Lincoln's-inn-fields—Improvements in fastenings for dress and other purposes. (A communication.)
545. Alexander Mitchell, Peterhead, N.B.—Improvements in harpoon guns.

Dated 25th February, 1857.

547. William Wood, Monkhill-house, near Pontefract, Yorkshire—Improvements in machinery or apparatus used in the manufacture of carpets and other pile fabrics.
549. James Fenton, Low Moor, near Bradford—An improved method of connecting the feed pipes of locomotive engines and tenders.
551. Laurent Piaud, 39, Rue de l'Echiquier, Paris—Improvements in ventilating and preventing inundations in coal mines.
553. Louis Emile Ossian Degrand, Paris—Certain improved lenticular glasses for lighting and reflecting or refracting.
555. John Henry Johnson, 47, Lincoln's-inn fields—Improvements in apparatus or instruments for measuring distances and elevations. (A communication.)
557. Moses Haym Picciotto, 8, Crosby-square—Improvements in preparing flax, hemp, and other fibrous substances.
559. Auguste Godet, Capne. de Marines, Bordeaux—Improvements in reefing sails.

WEEKLY LIST OF PATENTS SEALED.

March 6th.

2085. Paul Rapsey Hodge.
2087. Félix Estivant.
2103. George Tomlinson Bousfield.
2105. William Smith.
2113. John Taylor.
2128. John Talbot Pitman.
2130. Albert Demerit Bishop.
2160. Robert Elmy Garrood.
2202. William Young.
2388. Alfred Vincent Newton.
2582. William King Westly.
2814. Peter Walker.
2974. Alfred Vincent Newton.
3005. Warren A. Simonds.
40. David Baker.

March 10th.

2123. James Hudson.
2129. Alexander Chaplin.
2140. John Elliott.
2143. William Whittle.
2150. Samuel Cunliffe Lister.
2154. Jean Baptiste Justin Lassie.
2158. Alexander Rowand.
2176. Antoine Andraud.
2179. Carl Heinrich Schroder.
2200. Archibald Templeton and John Lawson.
2241. Victor Frederic Antoine Prost.
2242. Robert Brown.
2256. Marius Pellen.
2285. Thomas Arthur Dillon and John Gray, M.D.
2288. William Gostwyck Gard.
2315. Peter Armand le Comte de Fontainemoreau.
2524. William Brodie.
2694. Andrew Symington.
2761. William Ed. Newton.
2781. George Salt.
2782. James Broadley.
3051. Benjamin Goodfellow.
3091. William Armand Gilbee.
3. William Rigby.
15. Joseph House.
18. John Pettigrew.
75. Robert Turnbull.

Patents on which the Third Year's Stamp Duty has been Paid

March 2nd.

523. Joseph Bour.
529. Felix Abate.
612. Johnson Hands.

March 3rd.

562. James Smith.

March 5th.

548. Henry Bernoulli Barlow.

March 6th.

550. George Beardsley.

March 7th.

547. Thomas Dunn.
558. William Warne.
567. William Young.
573. William Peace.
580. William Mill.
583. Désiré Parfait Lefevre.
584. Zephirin Boitteux.
710. George Collier.

Journal of the Society of Arts.

FRIDAY, MARCH 20, 1857.

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NOTICE TO CANDIDATES.

Persons who intend to offer themselves as Candidates at the Society's Examinations in June next, in London and at Huddersfield, are desired to take notice that no one will be admitted to the Examinations who shall not have sent in his "Return paper" to the Secretary of the Society of Arts, before Monday, the 20th of April next.

EXHIBITION OF INVENTIONS.

The Society's Ninth Annual Exhibition of Inventions will be opened on Monday next, the 23rd instant. The Exhibition will be open every day till the 23rd of May, from 10 a.m. to 4 p.m., and is free to the members and their friends. Members, by tickets or by written order bearing their signature, may admit any number of friends.

FIFTEENTH ORDINARY MEETING.

Wednesday, March 18, 1857.

The Fifteenth Ordinary Meeting of the One Hundred and Third Session was held on Wednesday, the 18th inst., Professor Owen, F.R.S., in the chair.

The following Candidates were balloted for, and duly elected members of the Society:—

Blackmore, Martin
Field, William
Forster, W. E.
Freston, W. A.
Garland, Rev. George
Holland, William
Ludlam, Henry
Moxon, Thomas
Plummer, Benjamin, jun.
Shapcott, George Parkman
Smith, Thomas Mosdell.

The Paper read was:—

ON THE ECONOMY OF FOOD.

By Dr. Letheby, Professor of Chemistry in the College of the London Hospital, and Officer of Health for the City of London.

The statistics of crime, disease, mortality, and even of the general prosperity of a country, are intimately associated with all that concerns the supply of food to the people; the question, therefore, of the economy of food, by which I mean the facts of its production, distribution, and proper appropriation, is of great importance, for it alike commands the attention of the philanthropist, the philosopher, and the statesman.

I regret that the time at my disposal this evening will not permit me to enter upon those parts of the subject which concern the production of food and its supply. I must confine myself, as closely as possible, to those facts which have been clearly made out respecting the proper appropriation of it.

Hardly 20 years have elapsed since chemists and physiologists began to turn their attention to the composition of food, and the uses of its several constituents; but in the course of that time, the labours of Prout, Liebig, Dumas, Boussingault, Playfair, Johnston, Mulder, Lehmann, Persoz, Bernard, Payen, and others, have developed a body of facts, which, although of gigantic proportions, may yet be comprehended in a very simple expression, namely, that the various alimentary substances made use of by man and animals, contain at least four classes of constituents, each of which performs its own assigned function in the living animal economy. If the substance contains nitrogen, it usually serves for the nourishment of tissue, and is called plastic or nitrogenous; if it is deficient in nitrogen, but has an excess of carbon or hydrogen, it then undergoes combustion in the body, and is called the non-nitrogenous or respiratory; if it is fatty in its nature, it performs the double duty of maintaining animal warmth, and of assisting in the assimilation of nitrogenous compounds; and, lastly, if it is saline in its quality, it goes to build up the solid textures of the animal frame, and also does the important work of carrying new materials into the system and old ones out of it. Man and animals are alike in this particular—that they cannot live upon food which does not contain all these classes of constituents. Experience, and common instinct tell us also, that these classes must be associated in due proportion. In fact, a survey of the different kinds of food made use of by different nations, and of the peculiar habits of feeding which characterise particular classes of individuals, will show that there is ever an instinctive struggle to bring together, and to maintain in right proportion, these several constituents of food. This fact has been so forcibly expressed by a recent writer, the late Mr. Johnston, that I shall offer no apology for freely quoting him.

A glance at the table before you will show that different kinds of food contain different proportions of the four proximate principles to which I have referred; and, if we regard human milk as the type or model of what our food should be, it will be seen that whenever we partake of any aliment that is naturally deficient in one or more of these principles, we endeavour to increase it by art, as by using it with some

Table I.

NUTRITIVE VALUE OF FOODS,

Substances, 100 parts.	Water.	Fibrine Albumen, &c.	Starch, Sugar, &c.	Fat.	Salts.	Carboniferous.	Nitrogenous.	Total Nutriment.
Human Milk......	89	3 5	4.2	3.0	0.2	11.4	3.5	14.9
Cows Milk	86	4.5	5.0	4.1	0.7	14.8	4.5	19.3
Skimmed Milk...	87	4.5	5.0	2.7	0.7	11.5	4.5	16.0
Butter Milk	87	4.5	5.0	0.5	0.7	6.0	4.5	10.5
Beef and Mutton.	73	19.0	...	5.0	2.0	12.0	19.0	31.0
Veal..................	77	19.0	...	1.0	0.6	2.4	19.0	21.4
Poultry	74	21.0	...	3.0	1.2	7.2	21.0	128.2
Bacon	20	0.8	...	70.0	1.3	168.0	0.8	168.8
Cheese(Chedder)	36	29.0	...	30.0	4.5	72.0	29.0	01.0
„ (Skimmed)	44	45.0	...	6.0	5.0	14.4	45.0	159.4
Butter...............	15	...	...	83.0	2.0	199.0	...	99.0
Eggs.................	74	14.0	...	10.5	1.5	25.0	14.0	39.0
White of Egg.....	78	20.0	...	...	1.6	—	20.0	20.0
Yolk of Egg	52	16.0	...	30.0	1.3	72.0	16.0	88.0
White Fish........	79	19.0	...	1.0	1.2	2.4	19.0	21.4
Salmon	78	17.0	...	4.0	1.4	9.6	17.0	26.6
Eel	80	10.0	...	8.0	1.3	19.2	10.0	29.2
Wheat Flour......	15	11.0	70.0	2.0	1.7	74.8	11.0	85.8
Barley-meal	15	10.0	70.0	2.4	2.0	75.8	10.0	85.8
Oat-meal...........	15	12.0	62.0	6.0	3.0	76.4	12.0	88.4
Rye-meal	15	9.0	66.0	2.0	1.8	70.8	9.0	79.8
Indian-meal.......	14	9.0	65.0	8.0	1.7	84.2	9.0	93.2
Rice	14	7.0	76.0	0.3	0.3	76.7	7.0	83.7
Harricot...........	19	23.0	45.0	3.0	3.6	52.2	23.0	75.2
Peas	13	22.0	58.0	2.0	3.0	62.8	22.0	84.8
Beans	14	24.0	44.0	1.4	3.6	47.4	24.0	71.4
Lentils..............	14	29.0	44.0	1.5	2.3	47.6	29.0	76.6
Wheat Bread.....	44	9.0	49.0	1.0	2.3	51.4	9.0	60.4
Rye Bread....... .	48	5.3	46.0	1.0	1.4	48.4	5.3	53.7
Potatoes............	74	2.0	23.0	0.2	0.7	23.5	2.0	25.5
Green Vegetables	86	2.0	4.0	0.5	0.7	5 0	2.0	7.0
Arrow-roots.......	18	...	82.0	...	...	82.0	...	82.0

In this Table the carboniferous matter is calculated as starch; 10 of fat being equal to 24 of starch.

other food which is rich in the defective substance. Our white meat, for example, is deficient in fat; we, therefore, eat bacon with veal, with liver, and with fowl, or we capon the latter, and thus increase its natural fat. We use melted butter with most kind of fish, or we fry them in oil; while the herring, the salmon, and the eel, are usually fat enough in themselves, and are dressed and eaten alone. It is with a view to similar adjustment that we mix eggs and butter with sago, tapioca, and rice; that we add oil and the yolk of an egg to salad; that we boil rice with milk, and eat cheese with maccaroni. The same instinct has determined the use of vegetables with meat, and butter with bread. Bacon and greens, like pork and peas-pudding, is a conjunction of viands which does not owe its popularity to old habit or the mere taste of the epicure; and so with a dish, common in Ireland, under the name of Kol-cannon; the potatoe, which is poor in gluten, and the cabbage, which is usually rich in this ingredient, are mixed together, and thus they approach the composition of wheaten bread, but both of these substances are deficient in fat; add, therefore, a little bacon or fat pork to the mixture, and you have a Kol-cannon, which has all the good qualities of the best Scotch oatmeal, and to many it is more savory and palatable. Again, the mixture so usual in Ireland and Alsace, of butter-milk or curdled milk and potatoes, and the combination of rice and fat which makes the diet of eastern nations; even the little dab of butter upon the poor man's potatoe, and the bit of cheese that he eats with his bread for dinner, are matters not of luxury but of necessity, and they show how by long experience we have at last learnt to adjust the proximate constituents of food, so as best to maintain the health and vigour of the body. "But when, through force of circumstances, or through a distorted taste, the natural instinct for such adjustment cannot be gratified, or is foolishly thwarted, the health is endangered, the constitution gradually altered, the temperament modified, life shortened, families extinguished, and whole races of men swept from the face of the earth."

There is a law of nature, therefore, which regulates these things; and, to use the words of Liebig, "it is the elevated mission of science to bring this law home to our minds; it is her duty to show why man and animals require such admixture in the constituents of their food for the support of the vital functions, and what the influences are which determine, in accordance with the natural law, changes in the admixture.

"The knowledge of the law elevates man in regard to an important function which he possesses in common with the lower animals, above the level of those beings which are destitute of reason, and supplies him, in the regulation of those bodily wants which are essential to his existence and prosperity, with a protection which the lower animals do not require, because in them the commands of the instinctive law are not opposed or overpowered by the allurements of sense or by a perverted and resisting will."

The recognition of this law, and the practical application of it to the dietaries of a community, are obviously of great advantage, for not only would they tend to increase the health and strength of the population, but they would also effect a great economy in the general use of food. That there are difficulties which stand in the way of such an application cannot be doubted; in fact, the natural peculiarities of individuals, to say nothing of the differences of occupation, and the ever-varying quality of the food itself, is enough to create a doubt as to the possibility of its general application until the progress of our science has gone far beyond its present position. Nevertheless, there are certain well-acknowledged facts at our disposal which may serve as a temporary guide to practice.

A healthy vigorous man consumes annually about 704lbs. of solid matter in his food, and yet the weight of his body remains constant. This large amount of food has therefore not contributed to the bulk of his frame, but has evidently been expended in the manifestation of force. It is true that during the whole time portions of his system have been constantly undergoing change—that they have been worn out by labour and as constantly repaired by food; but to disentangle the subject from all such complicated phenomena, it is evident that the ultimate destiny and purpose of the food has been the development of force. Ought we not, therefore, to have some knowledge of the relations between them? In other words, have we not here, as in physics, the means of ascertaining the relations between cause and effect.

Experiments on healthy men have shown that the daily consumption of the two principle elements of food —namely, carbon and nitrogen, are about 5,500 grains of the former, and 125 of the latter. These are contained in a diet composed of 12oz. of beef and 20oz. of bread, with about half an ounce of butter. According to some authorities, this quantity of food has, for an ordinary machine, a thermotic power capable of raising fourteen millions of pounds one foot high; but we find that when it is consumed in the animal machine, and that, too, under the most advantageous circumstances, the power is not more than three-and-a-half millions of pounds to the height of a foot. Even this is excessive labour; for, to judge from the work done by an active labourer, or by a strong criminal at the treadmill, it rarely exceeds two millions of pounds; in fact, the last worthy only lifts about one million of pounds to the height of a foot every day.

Looking, therefore, at the mechanical power of food in the human body, it is clear that a large amount of motive force is otherwise disposed of than in the outward manifestations of work. Much of this is doubtless used in the various massive and molecular movements of the internal structures, each of which demands an expenditure of power which cannot be rightly estimated. The beating of the heart, the movements of respiration, the friction of the circulating fluids, and the peristaltic action of the viscera are examples of these. In the exercise of the brain there is also an expenditure of force, and the loss of animal heat by radiation is also a loss of power; and little is known of these various deficiencies beyond the fact that in the aggregate of the day's work they amount to from $\frac{1}{4}$ to $\frac{1}{14}$th of the entire force of the body. Assuming, however, that a ration of food containing 5,500 grains of carbon and 125 of nitrogen is capable of developing enough available power in the human system to raise a weight of one million pounds a foot high, we have then a standard of working power by which we may estimate the labour value of the several dietaries now in use,

Another point of importance in the economy of food is the question that relates to the proportions of the several constituents of food that ought to be associated in order that the work of alimentation may be properly performed; for, as I have already said, experience has shown that there is a natural law which regulates the demand for the plastic, the respiratory, the fatty and saline elements of food; and whenever it happens that either of these is deficient or in excess, the process of alimentation is soon interfered with, and the functions of the whole system deranged. Human milk, which may be regarded as a model food, furnishes an indication of how much of these principles should be taken together. From that we conclude, that the proportions which are best suited for the wants of the animal system, are one part of the plastic to about three of the respiratory, and in the case of the physiological ration to which I have alluded, viz., the 12 ozs. of beef and 20 of bread, with half-an-ounce of butter, these are the proportions in which they are combined: but an examination of the table which I have drawn up, will show that these proportions rarely occur in any single aliment. Hence, the necessity for associating different articles of food so as to obtain the results indicated in the standard. Acting on the supposition that the nitrogenous elements are the most important, attempts have been made to represent the equivalent values of food according to the proportions of these substances contained in them, but all such attempts have failed to acquire a practical character because of the circumstance that the proportions of the other proximate principles are never constant. (See Tables I. and II.)

TABLE II.

Nutritive equivalents—calculated according to the amounts of nitrogen in the dry substances; human milk being 100.

Vegetable.		Animal.	
Rice	81	Human Milk	100
Potatoes	84	Cows' Milk	237
Maize	100	Yolk of Egg	305
Rye	106	Oysters	305
Radish	106	Cheese	331
Wheat	119	Eel	434
Barley	125	Mussel	528
Oats	138	Ox-liver	570
White Bread	142	Pigeon	756
Black Bread	166	Mutton	773
Peas	239	Salmon	776
Lentils	276	Lamb	833
Haricots	283	White of Egg	845
Beans	320	Lobster	859
		Skate	859
		Veal	873
		Beef	880
		Pork	893
		Turbot	898
		Ham	910
		Herring	914

If, in fact, it were desirable to tabulate substances according to the proportion of their plastic or nitrogenous constituents, then the figures in the eighth coloumn of my table would represent the per centage nutritive powers of such substances; but if it were required to tabulate them according to their value as respiratory foods, then the seventh column would be indicative of their strength; while the tabular arrangement expressive of their total per centage amount of nutritive power would be expressed in the last column. A very little attention to the proportions of the several nutritive elements as expressed in this table will indicate the kinds of combinations that should be effected in order to secure the proper proportions of the model or physiological standard. But here also the application of science must be controlled by practice, for, as Poggiale observes, the nutritive power of alimentary substances depends also on their strength, their cohesion, and their digestibility, and frequently a substance rich in alimentary principles, but difficult of digestion, nourishes less, and produces less strength than another matter easily dissolved by the digestive juices. Thus, meat nourishes much more than cooked white of egg, although these two substances possess the same composition. If we add to flour one-third its weight of water, it is found that we shall not produce the same physiological effects as with bread which contains the same principles. Gelatine is more nitrogenous than meat, and yet numerous experiments have proved that dogs die after several weeks of this exclusive regimen, whereas with meat alone they live much longer. Again, the nitrogenous principles of the corticle layers of corn, as the bran of wheat, rye, barley, oats, &c., are refractory to the action of the digestive organs of man. And, lastly, it has been proved again and again by experiment, that an artificial mixture of the several constituents of bread and beef have not the nutritive value of the natural substances. It is important, therefore, that all our theoretical results should be carefully controlled by practice.

This leads me to the question of the actual proportions in which these substances are associated in the several public dietaries of the country. (*Vide* Table, following page.)

The smallest amount of food on which a healthy man can exist, and that only for a short time, is the punishment diet in prisons of a pound of bread a-day with water. This furnishes 8·2 parts of respiratory, and 1·4 of plastic. It is manifest, even from theory, that these amounts of nutriment are not sufficient to maintain the integrity of the system. A man, therefore, placed on such a diet soon begins to feed on himself and to lose weight; in the course of three days he will, on an average, lose 3lbs. in weight; and in most of the prisons where a man is under long punishment, as for example, over two weeks, he has full rations every fourth day. If these were not furnished to him—his system, though perfectly inactive as regards bodily work, would get thoroughly out of repair. But little less nutritive is the diet supplied at the County and Borough Gaols of England to the prisoner who is to be confined for a period of not more than seven days. His daily rations of bread, meat, and milk, contain only about 2 ozs. of plastic matter and 12·4 of respiratory. Next in the series are the dietaries of the County and Borough prisons when the prisoner is confined for more than two months and is not kept at hard labour. These furnish about 16 ozs. of solid respiratory matter, and 3·1 of plastic. In the Scotch prisons the amounts are 19 ozs. of the former, and 3·4 of the latter; while in the Irish gaols, it is 20·5 and 3·4. When the prisoner is employed at hard labour the dietary in the English prisons is 3·5 ozs. of plastic and 18·2 of respiratory; in the Irish, it is 3·6 and 22·0; and in the Scotch, it is 4·5 and 27·0. The Unions of England employ dietaries which are exceedingly variable, but the daily average of them is 2·8 ozs. of plastic and 14·2 of respiratory. This is somewhat less in nutritive value than the dietaries furnished to destitute debtors; for the average of these is 3·1 ozs. of plastic matter and 16·3 of respiratory, so that the poor man who who has to seek parish relief after the hard struggle of a long life, is actually worse provided for than he who by careless or improvident habits has become the inmate of a prison. And worse still, the convict whose crimes have made him a curse to society, and whose labour while in prison does not produce above two pound ten a-year, is carefully tended in a comfortable home, and has daily a rich diet of 3·6 ozs. of solid nitrogenous matter, and 18·4 of respiratory. In short, as the table will show, the day's ration of an unfortunate inmate of a Union is only about 33½ ozs. in weight, while that of the debtor is 38 ozs., and that of the convict is nearly 48 ozs. Such a contrast in the comforts of the three classes is remarkable, and we cannot fail to see in it an encouragement to crime; in fact, when an unusual want presses upon the poorer classes, the effect of this temptation is seen in the crowding of the public gaols. So clearly was this shown during the late famine in Ireland, that it became the subject of legislative interference. I would not urge, however, that the diet of the criminal should be much reduced, but rather that the food of the pauper should be increased; for to judge from the results of practice, as well as from the indications of theory, it does not appear that an individual can sustain himself at ordinary labour on a diet that contains less than 4 ozs. of nitrogenous matter and 13 of respiratory. An apt illustration of this is given by Dr. Christison, in a recent report on this subject. The prison diet at Perth, for long terms of imprisonment, consists of 19 ozs. of carboniferous matter and 6 of nitrogenous—in all 25 ozs., according to Dr. Christison's scale. Now it was not only found unsafe to reduce this amount for ordinary sedentary occupations, but it was found also, that prisoners could not work for any length of time upon it; for when the men were employed in pumping water for the prison use, they soon gave way under it. An addition of 8 ozs. of meat and 6 of bread was found necessary, and then they all worked vigorously and cheerfully. Again, the calamities which befel our soldiers in the Crimea, show that the dietaries of working men cannot be safely reduced beyond the physiological standard. To use the words of Dr. Christison, any scientific person conversant with the present subject could have foretold, as a certain consequence, sooner or later, of their dietary, that the British troops would fall into the calamitous state of health which befel them in the Crimea.

Table III.

DIETARIES AND THEIR NUTRITIVE VALUES.

	Weekly Consumption in Ounces.							Daily ditto.		
	Bread or Biscuit.	Meat.	Potatoe.	Meal, &c.	Milk.	Cheese.	Butter.	Carboniferous.	Nitrogenous.	Total solid nutriment.
Physiological	140	84	...	...	...	...	3.5	12.7	4.0	16.7
Prison Punishment	112	...	...	...	...	...	...	8.2	1.4	9.6
E. County and Borough Gaols—										
Under 7 days	121	...	...	23	39.5	...	...	12.4	2.2	14.6
Not hard labour	172	7.8	3.2	22.8	15.4	3.5	...	15.7	3.1	18.8
Hard labour	163	14.6	63.4	27.2	41.6	1.5	...	18.2	3.5	21.7
Scotch Prisons—										
Under 3 days	112	...	...	28	...	...	...	11.2	1.9	13.1
Not hard labour	30	7.5	152	73	175	...	...	19.0	3.4	22.4
Hard labour	76	10	176	100	175	...	...	27.0	4.5	31.5
Irish Prisons—										
Under 1 month	56	...	192	70	70	...	...	19.5	2.9	22.4
Not hard labour	56	...	192	60	170	...	...	20.5	3.4	23.9
Hard labour	64	...	219	70.5	170	...	...	22.0	3.6	25.6
Military Prisons—										
Under 84 days	56	...	...	119	210	...	...	22.2	3.8	25.8
Over 84 days	56	...	...	168	210	...	...	27.8	4.7	32.5
Destitute Debtors	156	16	52	22	21	...	...	16.3	3.1	19.4
Convict Prisons	161	36	112	12	12.8	...	...	18.4	3.6	22.0
Unions (Adults)	112	15.5	51	17	34	5.2	1.1	14.2	2.8	17.0
Unions (Children)	90	14	32	...	105	...	3.5	11.1	2.3	13.4
Lunatic Asylums	114	23	68	16	14	7	1.3	13.2	4.0	17.2
Public Hospitals	93	52	56	14	7	...	3.2	12.1	3.5	15.6
Army—										
Crimea	112†	112	...	...	...	...	...	14.5	4.8	19.3
Home	168	84	112	...	...	...	...	19.4	4.8	24.2
Madras	112	112	56	4*	...	...	...	16.5	4.9	21.4
Bombay	140	112	56	56*	...	...	...	22.2	5.6	27.8
Field (India)	168	...	...	168*	...	...	...	30.7	3.8	34.5
Navy	112†	112	56	...	...	...	...	17.7	5.0	22.7
Navigator (Crimea)	140	140	...	28	...	...	...	17.8	6.2	23.0
Navigator (Home)	320	96	64	...	...	12	4	18.6	7.7	26.3
Berwickshire labourer	122	...	...	224	224	...	...	37.1	7.0	44.1
Yorkshire labourer	280	126	28	...	210	...	49	42.2	8.8	51.0

In this Table only the most important articles of diet are mentioned, although the others, excepting beer, spirits, tea, and coffee, are calculated in the daily consumption. (*) are rations of rice, and (†) are of biscuit. Gruel is calculated at rate of 2 ozs. meal per pint.

In the military prisons of England the dietaries for long imprisonments furnish 4·7 ozs. of plastic matter, and 27·8 of respiratory, while the food of the prisoner who is confined for a period of less than 84 days, contains 3·8 ozs. of plastic matter and 22·2 of respiratory. With this diet the prisoners generally lose weight; in fact, out of a total number of 3,420 prisoners that where discharged from the military prisons in 1854, there were 2,952 that had lost an average weight of 7 lbs. 9 ozs. per man; only 304 had gained in weight, and they acquired an increase of 2 lbs. and 13 ozs. per man; the rest had not altered in weight at all.

The ration of the British soldier varies with circumstances. Thus the home ration contains 4·8 ozs. of plastic matter and 19·4 of respiratory. At Madras, it contains 4·9 of the former and 16·5 of the latter; at Bombay, it is 5·6 and 22·2; while the field rations in India contain 30·7 ozs. of respiratory and 3·8 of plastic. The rations in the Crimea were only 14·5 ozs. of the former and 4·8 of the latter. This amount of the plastic material is the same as that contained in the soldier's rations when at home or in the colonies; but it is considerably less than the Bombay rations, where the soldier has not the necessity for the food which his great exertions demanded in the Crimea. The dietaries of sailors contain 5 ozs. of nitrogenous matter and 17·7 of carboniferous.

As a contrast to these which may be regarded as dietaries, which just serve the purposes of ordinary existence, I may refer to the dietaries of hard working men. The troop of navigators which performed the task of making the railroad in the Crimea, was daily supplied with 20 oz. of bread, 20 ozs. of meat, 2 ozs. of peas, 2 ozs. of rice, 1¾ ozs. of sugar, 1 oz. of coffee, and 4 ozs. of rum per man. These, exclusive of the rum and coffee, contain 6·2 ozs. of plastic matter, and 17·8 of respiratory; and the men used large quantities of food in addition, which they purchased on the spot. A navigator's weekly consumption when at home, is 20 lbs. of bread 6 lbs. of meat, 3 lbs. of potatoes, 12 ozs. of cheese, 4 ozs. of butter, 1 oz. of tea, 4 ozs. of coffee, 8 ozs. of cocoa, and 2½ gallons of beer, besides about 4 lbs. of fresh vegetables, and sundry drams of spirit; excluding the beverages, these rations give a daily supply of 7·7 oz. of plastic matter and 26·3 of respiratory. A Berwickshire reaper, according to Dr. Christison, consumes about the same amount of these materials; for his rations contain 7 ozs. of plastic matter and 37·1 of respiratory. But the largest feeder of all is the Yorkshire labourer, who consumes daily about 8·8 ozs. of nitrogenous food, and 42·2 of carboniferous. These ought to furnish the equivalent in labour of three million three hundred thousand pounds lifted one foot high.

The dietaries of our public hospitals are generally of three kinds, viz., low diet, middle diet, and full diet. The last of these contains 3·5 ozs. of plastic matter and 12·1 of respiratory. A middle diet is little more than half the strength of the former, at least in respect of the plastic elements; and in a low diet there is hardly ¼ of the nourishing material.

The dietaries of lunatic asylums are very variable, but the average of them is shown in the table; and it will be seen that a day's rations for a man contains 4 ozs. of nitrogenous matter and 13·2 of carboniferous. In a general way the dietaries of women are about one-seventh less than those of men, and the dietaries of children ought not to be much less than those of women. At a large Institution in this metropolis, where many children at all ages are regularly maintained, the dietary contains 2·5 ozs. of plastic matter and 12·4 of respiratory; while that which has been recently sanctioned by the Poor Law Commissioners, as the dietary for the use of children in workhouses, furnishes 2·3 ozs. of plastic matter and 11·1 of respiratory.

In taking a general survey of the dietaries in use at different establishments, I have been struck with their great variations of quality and nutritive value. Taking for example the County and Borough Gaols of England, the daily allowances of food vary to the extent of many ounces. At Monmouth, for instance, the day's rations is 8 ozs. of bread, 14 ozs. of oatmeal, 8 ozs. of Indian meal and a pint-and-a-half of milk; while at Brecknock, it is 24 ozs. of bread, 3·4 ozs. of meat, 16 ozs. of potatoes, and 2 pints of gruel. The same kind of discrepancy exists in the dietaries of unions, hospitals, convict-prisons, and lunatic asylums. It is therefore of the utmost consequence that some fixed principles should be decided on for the direction of so important a matter. In the case of our gaols, the criminal, who is always well acquainted with the discipline of the several English prisons, will be apt, in the practice of crime, to make his selection of those localities where there is secured to him a comfortable and nourishing diet. Such inducements have a very pernicious tendency, and it is highly desirable that they should be abolished. Indeed, with a very slight knowledge of the resources of different places, it would be easy to fix upon a scale of dietaries that would be applicable to all occasions.

I do not mean by this, that it is possible, in the present state of our knowledge, to construct tables that shall at once indicate the nutritive or alimentary equivalents of different substances, so that failing in the supply of one, we shall be able to make it good by the substitution of another. This, as I have already said, is impracticable; for the relations between the several proximate constituents of different foods are very inconstant; and if we were to ask how much of meat, bread, rice, and potatoes may be substituted for each other, to supply the 2,000 grains of nitrogenous matter which are daily expended on an adult human body, the theoretical answer is 24 ozs. of the first, 51 of the second, 65¼ of the third, and 228½ of the fourth; but these quantities contain very unequal proportions of carboniferous matter, and hence their effects on the animal system is also very unequal, to say nothing of the fact, that in the act of appropriating them different amounts of labour would be demanded from the digestive organs. So also, in endeavouring to construct a table of nutritive equivalents, for the carboniferous matter contained in different foods, attention must be paid not merely to the relative proportions of fat, starch, and saccharine material, but also to the respiratory powers of these substances; for it is known that 10 parts of fat have the value of 24 of starch, or 25 of cane sugar, or 26 of fruit sugar, or 27 of spirit, or 77 of lean flesh; and experience shows us that these are the proportions in which they may be substituted for each other. A nation of hunters, and those who go naked and are exposed to great losses of temperature, consume large quantities of respiratory food; and if it so happens that the food is supplied in its least effective form, namely, as lean flesh, the quantity disposed of is enormous. The Hottentots, the Bushmen, and the inhabitants generally of Southern Africa are notorious for the large amount of food they consume. According to Barrow, they are the greatest gluttons on the face of the earth. "Ten of our Hottentots," he says, "ate a middling-sized ox, all but the hind legs, in three days; but they had very little sleep during the time, and had fasted the two preceding days. With them the word is to eat, or to sleep. When they cannot indulge in the gratification of the one, they generally find relief in flying to the other;" and the same authority, in speaking of the Bosjesmens, says they are as voracious as vultures. "The three who accompanied us to our waggons had a sheep given to them about five in the evening, which was entirely consumed by them before the noon of the following day." And those who have read the accounts given by Captain Parry, and others, of the gormandising powers of the Esquimaux, are familiar with the enormous quantities of food they can dispose of. Sir John Ross states that it amounts to 20lbs. of flesh and oil daily; and Captain Sir W. E. Parry once tried, as a matter of curiosity, how much food an Esquimaux lad scarcely full-grown would consume. In 24 hours he had 4lbs. and 4oz. of hard frozen sea horseflesh in the raw state, the same quantity of it boiled, 1lb. and 12oz. of bread and bread-dust, besides a pint and a quarter of rich gravy soup, a tumbler of strong grog, three wine glasses of raw spirits, and nine pints of water. But, as the late Dr. Pereira observed, the most marvellous account of a gormandising power is that published by Captain Cochrane, in his "Narrative of a Pedestrian Journey through Russia and Siberian Tartary." He says that the Russian Admiral Saritcheff was told that one of the Zakuti consumed in 24 hours the hind-quarter of a large ox, 20lbs. of fat, and a proportionate quantity of melted butter for his drink. To test the truth of this, the Admiral gave him a thick porridge of rice, boiled down with 3lbs. of butter, weighing together 28lbs., and, although the glutton had already breakfasted, yet did he sit down to it with great eagerness, and consumed the whole without stirring from the spot; and except that his stomach betrayed more than ordinary fulness, he showed no sign of inconvenience or injury. Captain Cochrane also states that a good calf, weighing about 200lbs., may serve four or five Zakuti for a meal. He adds, that he has himself seen three of them consume a reindeer at one meal, and that a Zakuti or Tingouse will easily devour 40lbs. of meat a day.

After such facts as these, it is not difficult to believe the assertion of Liebig, that if we were to go naked, like certain savage tribes, or if in hunting or fishing we were exposed to the same degree of cold as the Samoyedes, we should be able to consume half of a calf, and perhaps a dozen of tallow candles into the bargain daily, as warmly-clad travellers have related with astonishment of these people. In fact, the cooling of the body, by whatever cause, creates a demand for respiratory food, and he will best meet the requirements of the case who uses food rich in carboniferous matter.

Hence it is that the inhabitants of northern climates find a sustaining power in fats and oils, which is not possessed by any other kind of food; and Sir John Ross, in urging this on the attention of Arctic travellers, says, that the use of such food is the true secret of life in those frozen regions, and that the natives cannot subsist without it, for they become diseased and die with a more meagre diet. It is manifest, therefore, that the amount of respiratory matter contained in food is quite as important for consideration as that of plastic; and in all our endeavours to give a practical tendency to the theoretical results of science, attention must be paid to the more solid facts of experience, for he who constructs a table of nutritive equivalents, without regard to all the constituents of food, that is, to the chemical composition of it in its totality, fails to give a practical value to his labours. Even in the case of the least important of all the nutritive components of food, namely, the saline elements, it is not a matter of small importance as to whether they are present in right proportion or not, for they are contained in all the tissues and fluids of the body, and serve the purpose of giving solidity to the structures, and of acting as means of conveying nutriment into the system, and of carrying the wasted materials out of it. They are, therefore, among the prime agents of alimentation and secretion. Of all these elements common salt is the most important. Nearly half of the saline matter of our blood is composed of it: and though the food generally contains enough of this compound to supply the wants of the system, yet it is sometimes deficient of it, and then the necessity for a special supply is manifested by a craving which must be appeased; in fact, the use of salt as a condiment has always been clearly recognised, and has entered into the composition of every dietary. In some districts, where it is scarce, it becomes a valuable article of commerce, and even human life is bartered for it. Among the Gallas, for example, on the coast of Sierra Leone, the brother will sell his sister, and the husband his wife, for salt; and even in the more civilised parts of Europe it is made the subject of a tax, which Liebig truly says, is the most odious, the most unnatural, and the most disgraceful to human reason. Animals, urged by an instinct that is often superior to the boasted intellect of man, perceive the necessity for a free use of it. They will travel for miles to reach the salt lake or the briny spring, where their wants can be supplied; and from the accounts given by travellers, it appears that in many places where salt is not easily procured, the domestic animals perish for want of it. Warden says, that this is the case in the northern districts of Brazil, where the animals, deprived of salt, cease to be prolific, and then die. The experiments of Boussingault upon cattle, have also shown how important is the function of salt in nourishing the system. He found that when cows were deprived of it they got out of condition, the hair became rough and was matted together, bald patches appeared upon their bodies, and the temperament of the animals became cold and phlegmatic.

The other saline constituents of food are likewise of importance. Even the kind of salt contained in the water we drink may determine the kind of food that can be most economically appropriated. "Ireland," says Mr. Johnston, "presents us with a case in which this state of things appears to exist. The potato has become in a sense the national food of Ireland. This root contains larger proportions of potash and soda, but much less of lime and other mineral ingredients than either wheat or oats, which are the staples of English and Scottish life; but the greater part of the land is covered with a broad limestone formation, which impregnates with lime the spring and other water employed for domestic purposes, so that the mineral contents of what they drink supply the natural deficiency in what they eat. In this way it will appear that, the reasons for the adoption of a peculiar national diet may lie much deeper than political economy can generally go. It may depend upon refined chemico-physiological and chemico-geological relations, the discovery of which we may be very long indeed in arriving at."

The presence of a magnesian salt in the waters of certain districts of Europe seem to have an influence in producing disease. According to the recent investigations of Dr. Grange, there are two maladies, namely, goitre and cretinism, which appear in all climates, and among people of all habits; everywhere, in fact, are they observed but upon the sea-shore, and there is but one circumstance common to all countries in which these affections are found, namely, that the soil is composed of magnesian rocks. In France, Germany, England, and Sardinia, endemic goitre is found only in the districts of the magnesian limestone, where the waters contain an excess of magnesian salts. As other examples of the importance of the saline elements in food, I may refer to the mischievous effects of those foods which have been robbed of their natural saline matters, and to the results of an experiment made by the French academecians, who fed a dog daily on half-a-pound of boiled flesh, that had been previously soaked in water and pressed; in the course of 43 days the animal had lost one quarter of its weight, and after 55 days its emaciation was extreme.

These facts indicate the necessity for considering all the proximate constituents of food, and of giving to each its proper value in the theoretical construction of a dietary.

Again, it is of primary importance that the choice of a diet should not be dependent as much on the convenience of supply as on the requirements of the system. It is a remarkable fact, however, that these in nature are generally associated. Hence it is, that man in all parts of the globe finds in the produce of his own land ample and effective means of gratifying his wants. The cereals of Europe, as wheat, barley, oats, and rye, constitute the staple articles of diet with us; while rice is the most important food of Eastern nations, making the chief aliment of at least a hundred millions of persons. Maize is the principal food used by the Americans, and by the inhabitants of southern Europe, and of the Danubian Provinces; and everywhere the pulses or leguminous seeds are cultivated for their rich nitrogenous qualities. In the high table lands of Chili and Peru, the prolific quinoa forms the most available food; while here and there under a tropical sun, the banana, the plantain, and the sago palm, are the ready means of supplying our wants. All these substances exhibit peculiarities of composition which render them especially valuable in the localities where they are produced, and it will be seen by the table that their nutritive powers are very dissimilar. Wheat comes nearest in its proximate composition to the type of what our food should be, hence it is the most commonly used. Barley contains less nitrogenous matter than wheat, and its nitrogenous element has not so much the quality of gluten as of albumen. Barley, therefore, is unfit for the production of bread, but it makes good porridge. Rye, which is the food of Northern nations, makes a dark coloured bread, which has a disagreeable odour, and a sour taste, but it is highly nutritious, and keeps much longer than the bread from wheat. Oats make a substantial diet, which is particularly well suited for those who work hard. It is the principal food of the poorer classes in this country and in Scotland, and is generally used as porridge, or as cakes, because the bread from it is not light or spongy. It contains a great deal of fatty matter as well as gluten, and is therefore so very nutritious. Barleymeal, which is frequently substituted by fraudulent dealers for oatmeal, is not nearly so nourishing, and is a fraud not merely on the poor man's pocket, but also on his system. Maize, or Indian meal, like oatmeal, contains a large quantity of fat, but it is deficient in gluten, and will not make bread without the addition of wheat flour. It is, however, an agreeable diet, and is easy of digestion. When mixed with sugar and baked into cakes, it forms the food named Tassmananc by the Delaware Indians, who use it on their longest journeys. Rice is the least nutritious of all the cereals, for it is greatly deficient in fat and in nitrogenous matter. It cannot be made into bread, but is best cooked with butter, milk, and eggs, in the form of pudding. So slight is its nutritive, that even birds will starve upon it. Indeed, Poggiale found that strong fowls in good health were rapidly reduced by it in a few days. One bird lost 2,510 grains in twelve days, and another lost nearly 4,000 grains; while birds fed in a similar way with wheat rapidly increased in weight. It has been pretended that rice is the only aliment of the natives of India, but in reality it is associated with kari, which is a mixture of meat, fish, and vegetables. Quinoa has nearly the same composition as oatmeal; and the dhurra, or dhooria, of India, Egypt, and Africa, is much like that of wheat. The exact nutritive powers of banana, the plantain, and the sago palm are not known, but when in dry powder they have somewhat the nutritive value of rice. And with regard to the leguminous seeds, they are all rich in plastic or flesh-forming matter. A large quantity of this matter is easy of solution, and hence the meal of these substances makes good soup, but it cannot be formed into bread. The gram of the East is selected by travellers when they make their journeys across the desert, because of its light weight and its nutritive power. The lentil is the chief constituent of an expensive diet called ervelenta. Potatoes are far from being nutritious, although they constitute a large proportion of human food, and if they are not taken in conjunction with some substance rich in nitrogenous matter, they are hardly capable of supporting existence, though when mixed with flour and baked into bread, or eaten with butter-milk, cheese, or meat, they constitute a good respiratory diet. There is a remarkable similarity in the composition of the dry meal of rice, potatoe, and plantain; and the people who make use of these substances as their chief articles of diet, are characterised by a swollen condition of the abdominal region. This is the case with the Hindoos, the Chinese, the Negroes who feed on plantain, and the Irish. In each case the stomach must be enormously gorged, in order that the necessary amount of nitrogenous matter may be supplied to the system. All the true starches, or arrowroots, are wholly deficient in plastic matter, and cannot, therefore, be used as flesh-forming foods—they are only valuable as respiratory aliments. Fat also is devoid of nitrogen, but it serves a very important purpose in the animal economy, by promoting the alimentation of rich plastic food. Lehmann, who has paid much attention to this subject, says, "I was long since led, from theoretical grounds, to regard fat as one of the most active agents in the metamorphosis of animal matter; and this subjective conviction has since been converted into objective proof by numerous experiments regarding the fermentation of milk, namely, that this process cannot be excited by albuminous bodies in saccharine or amylaceous fluids, excepting with the co-operation of fat. I next ascertained that a certain, although small, quantity of fat was indispensable to the metamorphosis, and solution of nitrogenous articles of food during the process of gastric digestion. Elsasser has confirmed the fact by observation that, in experiments on artificial digestion, the solution of articles used in food is considerably accelerated by means of fat."

It is probable, also, that fat assists in the assimilation or appropriation of albuminous matter after it has left the stomach and has got into the general circulation, but of this we have no positive proofs. Muscular flesh or meat contains all the proximate elements necessary for prolonged and complete nutrition; and no artificial mixture of these elements will serve the same purpose for any length of time. Majendie, in his experiments, found that raw flesh from sheep's heads would preserve the health of dogs for months, but three times the quantity of chemically-prepared fibrine mixed with albumen and gelatine would not support life. There is, therefore, something in the organic combination of these substances in meat which renders it so perfect an aliment. Meat, however, requires an addition of respiratory food, and that to the extent of nearly twice its own weight; we, therefore, associate it with bread, potatoes, and rice. The albumen of eggs is still more nitrogenous, and requires fat or some other rich carboniferous material to bring it down to the normal standard of a good diet. The same also is true of blood, which contains a large quantity of albumen, and in preparing it for food, as in the case of black puddings, it is associated with rice or barley, and plenty of fat. Blood also contains the saline elements of food in large proportion, and if it were not that it is prone to undergo decomposition, and that it gives a disagreeable look to meat, and makes it hard on cooking, it would be advisable not to draw it from the animal at the time of slaughtering. In case of veal, the nutritive power of the meat is considerably reduced by the too perfect extraction of the blood. Fish approaches veal in its nutritive power, but it is much more easy of digestion, especially when it is not of the oily kind, and is, therefore, a favourite article of diet with the dyspeptic and the invalid. Lastly, milk may be taken as the natural standard of food, for it is the only material on which an animal can feed continuously. It doubtless contains the plastic and respiratory matters in those proportions which are best suited for the wants of the system, and the only drawback to its use with adults is the occasional indigestibility of the butter contained in it. When deprived of this by churning or skimming, or when mixed with farinaceous compounds, it agrees well with the stomach, and is very nutritious. The curd of milk or cheese is the nitrogenous portion of this fluid, and is, therefore, rich in plastic matter. When associated with bread and butter, it forms a staple article of diet. Old cheeses, which are in a state of decomposition, are thought to promote digestion, by setting up a molecular change among the contents of the stomach.

Experience has shown that there are certain articles of food which are not particularly nourishing in themselves, but which serve some very important purposes in the animal economy. This is the case with tea and coffee; in fact, the use of a vegetable infusion, containing astringent matter and an active principle, rich in nitrogen, has been almost universal among mankind from the earliest times. To use the words of Mr. Johnston, "the practice has prevailed equally in tropical and in arctic regions. In Central America, the Indian of native blood, and the Creole of mixed European race, indulge alike in their ancient chocolate. In Southern America the tea of Paraguay is an almost universal beverage. The native North American tribes have their Apallachian tea, their Oswega tea, their Labrador tea, and many others. From Florida to Georgia in the United States, and over all the West India Islands, the naturalised European races sip their favourite coffee; while, over the Northern States of the Union, and in the British provinces, the tea of China is in daily and constant use.

All Europe, too, has chosen its prevailing beverage; Spain and Italy delight in chocolate; France, and Germany, and Sweden, and Turkey, in coffee; Russia, Holland, and England, in tea—whilst poor Ireland makes its warm drink of the husks of the cocoa, the refuse of the chocolate-mills of Italy and Spain.

All Asia feels the same want, and in different ways has long gratified it. Coffee, indigenous in Arabia or the adjoining countries, has followed the banner of the Prophet, wherever in Asia or Africa his false faith has triumphed. Tea, a native of China, has spread spontaneously over the hill country of the Himalayas, the table lands of Tartary and Thibet, and the plains of Siberia; has climbed the Altais, overspread all Russia, and is equally despotic in Moscow as in St. Petersburgh. In Sumatra, the coffee leaf yields the favourite tea of the dark-skinned population; while Central Africa boasts of the Abyssinian chaat as the indigenous warm drink of its Ethiopian people. Everywhere unintoxicating and non-narcotic beverages are in general use among tribes of every colour, beneath every sun, and in every condition of life. The custom, therefore, must meet some universal want of our poor human nature! In fact, an unthought-of chemical instinct has guided men in the selection of these beverages long before any chemical knowledge existed of the substances contained in them. "What constitutional cravings, common to us all," says Johnston, "have prompted to such singular results? Through how vast amount of unrecorded experiences must these results have been arrived at!" And to bring this home to our individual experiences, who has not felt the exhilirating influences of a warm cup of good tea or coffee?

The physiological action of these beverages appears to be of a somewhat singular quality, for while they excite the brain, they calm the nervous system generally, and though they produce a state of wakefulness and activity, yet they also induce a species of languor and repose. Lehmann, who has inquired much into their physiological effects, has ascertained by experiment, that coffee greatly diminishes the wear and tear of the system; it oils the machinery as it were, and checks the waste of friction; for those who use it find that during active exercise the destruction of tissue is prevented, and that there is less demand for food; in fact, with a maximum of work to perform, and a minimum of food to accomplish it, he will best sustain his vital power who has resorted to a cup of tea or coffee. Hence its value as a means of economising food, and hence its importance to the poor labouring man; for it is a striking fact, as my great authority observes, that the poorest and humblest amongst us, who has his own little earnings to spend, devotes a small part of it to the purchase of tea or coffee. He can barely buy bread and milk, or potatoes and salt, yet the cup of tea or coffee is preferred to the extra potatoe or the somewhat larger loaf, and if thereby his stomach is less filled, his hunger is equally stayed, and his comfort both bodily and mental wonderfully increased. Besides the mere brickwork and marble, so to speak, by which the human body is built up and sustained, there are rarer forms of matter upon which the life of the body and the comfort of animal existence depends. This truth is not unworthy the consideration of those to whom the management of our public institutions is committed; and it is not an important question to solve, whether the lessening of the general bodily waste which would follow the consumption of a daily allowance of coffee or tea, would not cause a saving in bread and meat at least equal to the cost of the luxury; and with respect to the poor inmates of our Unions, it surely cannot be a misplaced humanity to minister to so innocent a craving of the almost worn-out body.

Another point of much importance in the economy of food is that which relates to the preparation of it by cooking, &c., for the results of inquiry show that the processes of cooking and otherwise preparing alimentary substances, have much to do with their digestibility and nutritive value. The experiments of Beaumont and others have proved that overdone meat takes a much longer time for digestion than that which is just sufficiently cooked; indeed the real objects of cooking are to soften the intercellular matters of food, to set by coagulation the fluid albuminous constituents, and to develop flavours which the raw aliment does not possess. The temperature at which this may be effected is not very high; for a heat of from 150° to 160° of Fahrenheit is sufficient not only to solidify the juices of flesh, but also to destroy their sanguinous appearance. In the process of cooking, therefore, the temperature should never exceed this point. The researches of Liebig have thrown a light upon this subject, and have endowed it with a practical and physiological importance. He has demonstrated that we cannot have at the same time a savoury bouilli and a rich broth. If it be desirable to obtain one, we must without hesitation make a sacrifice of the other; and he has furnished us with rules for the management of meat in either case. When it is required that the boiled meat should possess the greatest possible amount of nutriment and flavour, it must be treated in such a manner as to fix all the constituents within the mass. It is, therefore, to be suddenly plunged into boiling water, which will at once coagulate the albumen of the surface, and so lock up the minutest pores through which the juice of the meat would otherwise escape, and then if the temperature be reduced to about 160, and maintained at that point until the joint is uniformly heated throughout, it will be thoroughly done, and will have the softness, flavour, and elasticity of the most delicate viand. In the process of roasting the meat should first be placed very near to a sharp fire. This, as in the last case, will set the albumen of the surface; then it should be withdrawn to such a distance as will secure its being heated throughout to a temperature of 160°. When, however, it is desirable that a rich broth should be prepared, we must use those means which will secure the extraction of all the nutriment. The meat is to be finely chopped and digested in its own weight of cold water. After having macerated for a few hours, it is to be slowly heated to ebullition, and then, by gently boiling for a few minutes, the albumen is coagulated, and the broth separates as a clear fluid. It only requires the proper addition of a little seasoning and burnt onions to be converted into a delicious broth; and by further evaporation at a low temperature, it becomes concentrated, and at last leaves behind a brown extract, which possesses all the flavour of well cooked meat. This extract, when dissolved in about 30 parts of water, and flavoured with salt, yields at any moment a most excellent soup. All the shreddy fibres of the meat which have been separated by this process are tough, tasteless, and altogether wanting in nutritive power; in fact, the residue of the flesh of different animals cannot be distinguished from each other, for all the peculiarities of their flavour have been extracted in the broth. This confirms the view of Proust, that the peculiar constituents of broth exist ready formed in the flesh. The proportions of extract vary from $\frac{1}{2}$ per per cent. for beef to $1\frac{1}{2}$ per cent. for veal. A prolonged ebullition will extract more of the gelatinous matter, but will not increase the nutritive power of the liquor; in fact, gelatine imparts no taste to broth, and the experiments of the French academicians have proved that it is altogether wanting in nutritive power. Hungry dogs turn from it with loathing, and if, under the impulses of hunger, they are compelled to eat it, they soon become emaciated, and die with all the symptoms of starvation. M. Donne tried the effects of jelly upon himself, and though he took daily from 300 to nearly 800 grains of the dry gelatine in the form of a sweet aromatised jelly, yet in six days he had lost 2lbs. in weight, and during the whole time he was tormented with hunger, and suffered from great faintness, which nothing but a good dinner would remove.

Again, the investigations of Liebig demonstrate that the process of salting meat is very improper, for the brine extracts the juices of the flesh, and so removes most of the important constituents; in fact, salt junk, and the hard beef of the Navy have long been known as foods of very inferior value, and as being the cause of scurvy and other starvation diseases.

It is a matter of national importance how we can best preserve food without depriving it of its nutritive power, for by so doing we not only guard against the dangers of famine, but we also facilitate, even in times of plenty, the equal distribution of food. From the earliest times attention has been directed to this subject, but it is only since the date of our first Arctic exploration that anything of a really practical character has been made out. Then it was that the processes now so extensively practised were first put into operation; and as soon as the value of the preserved food became known it was employed, not merely for those purposes, and in those climates, for which it was originally intended, but for a far more extensive object in all parts of the world. And now, at the tropics and at the poles, wheresoever man finds a habitat, there he has the means of supplying his wants. Thousands of tons of preserved meats and vegetables are annually exported from this country to our distant colonies, where food is scarce or perishable, and, conversely, there are many of our far-off possessions where the surplus food of a scattered population is made available for the wants of those who are at home.

This is not the time for discussing the rationale of the processes which are followed, but I may say that they are founded upon two principles, namely, the exclusion of atmospheric air, and the perfect desiccation of the substance. The former is usually applied in the preservation of animal substances, and the latter of vegetable. Both of them however are most easy of application, and their value cannot be overrated. In the case of vegetables, the preparations of Masson, Chollet Edwards and Makepiece are all that can be desired; and the preserved meats of Ritchie and McCall, Gamble, and others, have done good service.

In the preparations of the various flours or meals of grain, it is still a question whether there is any advantage in removing the husk or the bran. It is true that it contains a very large per centage of nitrogenous matter, but the real question is whether this matter is assimilable or not. Johnston, Liebig, and many others assert that it is, and they therefore recommended that whole meal should be used as food; indeed, the remarks of Liebig on this subject are very emphatic. The separation of the bran from the flour, he says, is a matter of luxury only, and is injurious rather than beneficial as regards the nutritive power of the bread. In ancient times, down to the period of the Emperors, no bolted flour was known. In many parts of Germany, especially in Westphalia, the entire meal, including the bran, is baked into the brown bread called Pumpernickel, and there is no country where the digestive organs of the population are in a better condition. On the other hand, Poggiale, who is a great authority on this subject, declares that the only use of bran is to retain food in the alimentary canal. Its composition shews that 39 per cent. of it are wholly unassimilable, and this he has proved by giving it to dogs, which lose weight by it. He has even found the bran unchanged in the matter discharged from their bodies; nay more, he has afterwards collected it and given it to other dogs, and then to fowls, so that it has passed through the systems of three animals successively, and yet it has remained unchanged. Still, however, it is an admitted fact, that a little bran in food favours assimilation, and, therefore, Poggiale recommends that about four per cent. of it should be retained. A too light bread, given to a robust young man who is exposed to hard labour, does not satisfy the cravings of hunger, and, although he may be well nourished, he does not feel that comfort and fulness of the body which a coarser diet produces; a small admixture of bran, therefore, with the food, may take off the attention of the stomach by engaging it in a somewhat severe labour. I have been told by Mr. Milner, who is the medical superintendent of the convict prison at Wakefield, that when the Scotch prisoners, who are accustomed to a poor and heavy diet of oatmeal, are passed into the English prisons, where the dietary is comparatively rich, they generally suffer for a time from a sinking sensation of hunger, as if the stomach felt the necessity for its wonted labour.

Many ingenious contrivances have been suggested for increasing the nutritive power of wheat flour; one of these has received the attention of practical men. It is the invention of M. D'Arblay, and is a means whereby in the process of grinding the flour, the meal may be separated so as to contain more or less than the average amount of gluten, and by the admixture of rivitts, or the hard wheat of Sicily, Russia, Sardinia and Austria, the per centage of gluten may be greatly increased. Flour of this description is, I am told, largely imported into this country, for increasing the nutritive power of our poorer varieties.

Another means of improving the alimentary value of wheat is, by mixing it with rich soup or extract of meat. This constitutes the patent process of Mr. Borden, whose biscuits contain about 32 per cent. of flesh-forming matter; in fact, a pound of biscuit contains the extract of 5 lbs. of meat mixed with half-a-pound of flour. An ounce of this grated into a pint of water, and then boiled and seasoned, makes an excellent soup.

Other modes of increasing the nutritive power of vegetables, are founded on the removal of their less valuable respiratory compounds. By the fermentation of potatoes, as is practised in Germany, the saccharine and starchy matters are converted into spirit, which is easily separated by distillation, and then the residue or dross contains all the gluten of the potatoe in an unchanged form, and is, therefore, valuable as fodder for cattle. It might even be mixed with the food of man, as an addition to the plastic elements. A similar process is followed in this country by Mr. Dray, who, manipulating with beet-root and mangel-worzel, obtains a high per centage of spirit and a valuable nitrogenous fodder.

In this country many thousand of cwts. of flour are annually used in the manufacture of starch; and, as the process is usually followed, all the rich gluten is lost; but by a contrivance, originated, I believe, by Mr. Orlando Jones, and practised by Durand and others, the gluten is extracted from the flour by an alkali, and is then precipitated in an edible form, so that it can be mixed with flour and made into bread. This, in the economy of food alone, is a valuable application of science.

I regret that I have not time to discuss the question of the relative digestibility of different foods, for this, in an economical point of view, is clearly of the greatest importance. Already the labours of Gosse, Beaumont, Schultz, Lallemand, Blondlot, Bidder, and Schmidt, have exposed a number of valuable facts, which might be made the basis of practical good. The general tendency of them has been to show not only that different articles have different degrees of digestibility, but also that the processes of cooking and preparing them have much to do with their nutritive power. The flesh of game and of young animals, and meat that is rather high, are more easily digested than that of others; so it is with the flesh of the heart, and of the viscera generally. This is due to the more tender condition of that investing tendonous matter which surrounds every fibre of muscle, so that the gastric juice quickly permeates and dissolves such tissues. A dish of tripe is an example of a loose albuminous tissue, which is easily dissolved. In one hour it is generally gone from the stomach, whereas a meal of beef or mutton will remain from three to four hours. The sarcolemna of salted meat is always hardened, and hence those foods require a long time for digestion, and frequently disagree with the stomach. The true condiment for such a diet is a little vinegar, which has the power of softening the tendonous structure, and of giving access to the digestive fluids. Pickles and cold beef are therefore associates in science as well as in experience.

A last point for consideration is the effect of over or under feeding on the animal system. Too much respiratory food favours the development of fat, and often checks the proper nutrition of the muscular tissues; hence it is that rice feeders and potato eaters, and those who indulge in fermented liquors, are often bloated in their appearance, and are not capable of prolonged exertion. The brewer's-drayman is a bad subject for the wards of a hospital, for though he usually has all the appearance of a man possessed of great muscular strength and vital endurance, yet it is not so in reality, for the muscular tissues have been encroached upon by fat, and the general power has been weakened by an undue influence of the respiratory element. Most of the animals in our menageries, from a too liberal allowance of respiratory food, die from fatty degeneration.

When the plastic constituents of food are in excess, the system becomes excited, as if from the development of force, and a savage disposition is often the consequence. A nation of animal feeders is always a nation of hunters, for the use of a rich nitrogenous diet demands an expenditure of power, and a large amount of physical exertion. Accumulation of the nitrogenous elements in the blood is often a prolific source of disease: in fact, very recently attention has been drawn to the diseases of over-fed convicts.

On the other hand, a deficiency of food quickly leads to the breaking up of the animal frame. Plague, pestilence and famine, are always associated in the public mind, and the records of every country show how closely they are related. The medical history of Ireland is remarkable for the illustrations of how much mischief may be occasioned by a general deficiency of food. Always the habitat of fever, it every now and then becomes the very hot-bed of its development. Let there be but a small failure in the usual imperfect supply of food, and then the lurking seeds of pestilence burst into frightful activity. The famine of the present century is but a too forcible illustration of this, for it produced epidemics which had not been witnessed in this generation, and it gave rise to scenes of devastation and misery which are not surpassed by the most appalling of the middle age. The principal form of the scourge was known as the contagious famine fever, and it spread, not merely from end to end of the country in which it had originated, but, breaking through all boundaries, it crossed the broad ocean, and made itself painfully manifest in localities where it was previously unknown. Thousands fell under the virulence of its action, for wheresoever it came it struck down a seventh of the people, and of those whom it attacked one out of nine perished. Even those who escaped the fatal influence of it were left the miserable victims of scurvy and low fever. Another example, not less striking, of the terrible consequences of what may be truly called famine, was the condition of our troops during the early part of their sojourn in the Crimea—with only just enough of food to maintain the integrity of the system at a time of repose, and at ordinary temperatures they were called upon to make large muscular exertions, and to sustain the warmth of the system in the midst of severe cold. What could be expected but that the scourges which wait upon famine, as fever, diarrhœa, dysentery and scurvy, should make their appearance in great force, and that the soldiers should perish by thousands. With an average strength of 24,000 men, the deaths from sickness alone, in the course of seven months, were at the rate of thirty-nine per cent., and in some cases it mounted up to seventy-three. "Never before," says Colonel Tulloch, "is there record of a British army having sustained so frightful a loss in so short a time." During the Peninsular War, though the troops occasionally suffered much from sickness, the loss from that cause did not average above twelve per cent. for a whole year. Even in the ill-fated expedition to Walcheren, which threw the nation into mourning, the deaths amounted to only about $10\frac{1}{3}$ per cent. for the half year; and here, in this great city, with all the aggravating circumstances of want, vice, infancy, old age and disease, it did not reach to two per cent. during the time that our strong men were dying by thousands. "Armies have perished by the sword, and have been overwhelmed by the elements, but never, perhaps," says Colonel Tulloch, "since the hand of the Lord smote the host of the Assyrians, and they perished in a night, has such a loss from disease been recorded as on this occasion." May the lesson of so great a calamity be wisely applied to the future profit of the country!

DISCUSSION.

Dr. Lyon Playfair, C.B., F.R.S., in obedience to the call of the chairman, would open the chemical part of the discussion, or rather it could scarcely be called a discussion, inasmuch as the paper comprehended so much with which he agreed, that he had very little supplementary matter to state in relation to it. It was only quite lately—in fact, during the last few years—that they had really understood that the chemical force which is generated in our body was precisely the same chemical force which could be converted into mechanical force out of the body. Jould and Thompson had thrown much light on this subject, and it was only occasionally, as science diverged into different fields, that they could obtain information which enabled them to discuss the subject in the true spirit of philosophy. When they recollected what had been the amount of experience on the subject of diet since the period when Adam first plucked the fruits of Eden, they might be astonished that it was not until 12 or 15 years ago that they understood anything of the science of diet. They did not until then know what it was that formed the flesh and muscular tissues of the body—what parts of food gave heat, and what supported the respective functions. All this had been made known within the last few years, and although they might regret to find their large public bodies not coming up to the existing state of science in its applications to human well-being, it was still to be remembered that all our knowledge is of modern growth, and far from perfect. The chemical knowledge on this subject had, no doubt, advanced rapidly; although it was yet of the crudest character. The albumen of an egg produced flesh, hair, claws, tendons, feathers,—a number of parts of the body produced from the simple substance of albumen; but that was all one consideration as yet for the chemist. Physiologically they did not know how the albumen was converted into these parts. The human body was a machine which required force to work it, like a steam-engine; but there was this distinction between the body and a machine for manufacturing purposes, that the latter wasted its parts slowly by wear and tear, and it was not necessary that the parts should change by the manifestation of force; it produced certain results, but the parts of the engine remained unaltered. It was very different with the animal body, every manifestation of force caused the destruction of part of the structure of the machine: he could not raise his hand without part of the muscular action of the arm being destroyed by the motion; he could not have a sensation or thought of the brain without some change in the matter of the brain being produced by that thought, therefore the structural parts of animals were continually changing as a condition of their use, and in this respect the machine of an animal body differed from ordinary machinery. Now, what did the machinery of an animal consist of? A man of 150lbs. weight contained as much as 113lbs. of water, and only about 21lbs. of nitrogenous matter; he contained also about $6\frac{1}{4}$lbs. of fat, and about $9\frac{3}{4}$lbs. of mineral substance. How long was this machine to last? There was an old tradition with which they were all acquainted—that the animal body lasts for seven years; and then undergoes an entire change. If they took the average rate of waste in an adult human being, he would undergo a change in twelve weeks instead of seven years; that is, the rate of waste would destroy the fleshy structure of the body in twelve weeks—some parts more slowly, some parts more rapidly. The carbon would be burnt in the blood in that time. A man consumed about 2,000 gallons of air per day, or seven hundred weight per year, and this would burn the contents of the body as if they were put into the fire. The amount of air inspired would burn the whole carbon of the blood in three days, and unless the man had food, or unless the air acted upon the structures of the body, it was impossible for the machine to go on. Therefore they must produce force, as in a steam-engine, and they must supply the structures which were wasted. How much did it waste? If they took the public dietaries (and much had been done in that way)—if they took the experience of all nations, although with different descriptions of food—it resulted in giving a man in each case almost the same amount of nutritive ingredients. Take, for instance, the diet supplied to soldiers and sailors. Although the description of food varied in England and India, in Holland and in France, yet the result showed that the average quantity of nutritive ingredients supplied to soldiers was about thirty-six ounces dry flesh-formers per week, and in the navy, thirty-five ounces. The Dutch soldier, in time of peace, had only about twenty-four ounces of nitrogenous food per week, but he could not fight upon that, and in war the rations were increased to 35 ounces; so that what was termed "Dutch courage" had in reality some signification. He quite agreed with the author, that although that was sufficient, and represented fairly the amount of wear and tear of an adult man in a state of health and under ordinary labour, yet it did not represent the wear and tear of a man subjected to great bodily exertion; and therefore the 43 ounces of food taken by the navigators in the Crimea, and the 60 ounces taken by the Yorkshire labourer, (although he thought that was a poetical amount,) were cases in which the labour was exceedingly great. He would take 36 ounces of dry flesh-forming matter as a fair amount for an adult man performing an ordinary amount of labour, and from 70 to 74 ounces of carbon per week; and the proportion of carbon in flesh-giving matter to that in the heat-giving matter, should be as 1 to 3 in an adult man. The aged men in our hospitals and union-houses should receive from 24 to 28 ounces of dry nutriment per week, and from 72 to 78 ounces of carbon; and the proportion of flesh-giving carbon to that of heat-giving carbon, might be given as 1 of the former to 5 of the latter. For young persons—boys from 12 to 13 years of age—the quantity should be about 17 ounces of flesh-forming food, and 58 ounces of carbon, the proportion of the one description of carbon to the other being as 1 to 6, owing to the great amount of bodily exercise generally taken at that period of life, rendering a less quantity of heat-giving carbon necessary. He had apologised for the public dietaries as not having been much benefited by science, but in some cases they displayed the most extraordinary ignorance of the subject. He might mention the case in the Birmingham gaol, with which they were all familiar. The prisoner was deprived of the ordinary amount of food and put to crank labour. If he did not perform the stipulated quantity of labour, he was subjected to a further reduction in his food. This was much the same as if an engineer desiring to get more work out of a steam engine, instead of putting on more coals, raked the fire out of the furnace, and when the engine stopped from sheer inability to go on, he dashed it to pieces because it had stopped. There was one other point to which he would allude, which had only been just hinted at by the author, that was, however much they knew from science with regard to food, it would be dangerous to tamper much or too rapidly with public and national dietaries until they knew more upon the subject. The character of a people depended very much amongst other things upon the description of food they consumed. Though political institutions, race and other circumstances, no doubt, influenced character, the native food of a population was far from unimportant. In the case of a hunt we see an omnivorous animal—man—mounted on a graminivorous horse, accompanied by carnivorous animals, dogs, pursuing a vegetable-feeding hare, or a flesh-eating fox. Hence force might be had either from animal or vegetable food. But it was a different thing with regard to the temperaments of people and animals. The bears of India and America, which fed upon acorns, were mild and tractable; those of the polar regions, which fed upon seals and other flesh, were wild, untameable animals. Taking instances of people, the Peruvians, whom Pizarro found in the country upon his conquest, were a mild inoffensive people, subsisting principally on vegetable diet, whilst their brethren in Mexico, found by Cortes, were a warlike and fierce race, and eat animal food. The same might be said of the aborigines of Australia. Whilst living in their native wilds, and feeding entirely upon the produce of the hunt, they were wild and turbulent in their dispositions, but as soon as they were brought to a due proportion of both animal and vegetable food in the colony, they became mild, tractable, lethargic, and inoffensive, in fact died out. The Mahomedan population of India, subsisting purely upon flesh, were warlike, whilst the vegetable feeding people of Hindoostan were a quiet race and less warlike. The most striking illustration of this was afforded by Mr. Anderson, in the account of his recent travels to Lake Ngami. Passing through a country inhabited by a fierce tribe, in the extreme part of his journey, he came suddenly upon a corn-growing people, who had acquired the arts of peace, and who were mild and inoffensive, entirely unlike the savage tribes around them. Therefore, he contended, it would not do to alter too suddenly the food of a people without considering at the same time the probable influence on the character of the population. Mulder probably carried the idea too far when he said that the political changes and frequent revolutions which had taken place in France were owing to the *soup maigre*, a light and varied diet of the French, whilst the constitutional predilections of Englishmen were to be attributed to their beefsteaks and porter. One word in conclusion. Deficient as we still were in our knowledge, we had enough to enable us to form a tolerable acquaintance with the properties of food. But this would be of little use to us in our generation, unless the female portion of our population acquired that knowledge so as to impart it to those whom they educate. Men were, after all, poor educators compared with women. Women also were chiefly the feeders of men (although they had much higher functions in addition), therefore, unless women learnt as a part of their education the nature and composition of food, there was little chance of speedily diffusing that amount of popular knowledge which would enable the discoveries in the science of dietetics to be applied to the well-being of the human race.

Dr. Carpenter, F.R.S., would, in the first place, acknowledge how entirely physiology was indebted to chemistry for a knowledge of the value of foods. It was impossible to speak too strongly of the chemical researches in this direction for the last 15 years in clearing up much that was before doubtful, and putting the physiologist in possession of those principles on which a theory of food might be founded; and physiology must still look to chemistry on a great many points which must be more cleared up before that theory could be completed, but at the same time there were certain important facts in the physiology of food, which chemistry was not in a position yet to account for. He might instance the great importance of fresh vegetables; this was a point on which chemistry did not yet afford a satisfactory account. It had been supposed that a deficiency of potash in food was the cause of scurvy, which came on when fresh vegetables were withheld. He did not think the evidence in support of that doctrine was satisfactory; but certainly the influence of fresh vegetables in the cure of scurvy, was such that no medical man would be justified in substituting so many drops of liquor potassæ for a vegetable soup, seeing that in the one case there was a certain remedy for the disease, whereas in the other it was of doubtful value. The result of experience was, that the value of the different anti-scorbutics was not proportioned to the quantity of potash which they contained. Citric acid was better than no lemon juice at all, and even bad lemon juice was better than none. He adverted to this to show that there were some facts which had yet to be elucidated, and which were of the highest importance; for he held that the tables before them did not completely represent the relative values of foods in regard to all the requirements of the human system. Supply a man with flesh-forming food—fat and starch, and shut him up on board ship for 6 or 12 months, and if he had no fresh vegetables, he would certainly have scurvy. There was a circumstance which went to confirm this. During the year which followed the potatoe famine in Ireland, the high price of vegetables prevented their use as a diet to a very considerable extent, and the scurvy broke out in many poor-houses in this country. The American whaling-ships which went out on voyages of 3 or 4 years took out with them large quantities of potatoes, and if they fell short, they were served to the men in slices raw, to be eaten with vinegar; and whilst that was done, they bid defiance to scurvy. It was the duty of those who had the provisioning of ships for long voyages, to attend to so important a matter as this. A great deal of the mischief in the Arctic voyages, was owing to a deficiency of good lemon-juice. The supply had sometimes been of inferior quality. Sir James Ross returned from his exploration much sooner than the nation expected, and he was accused of not having used the exertions he ought to have done; but Sir William Burnett—the head of the Medical Department of the Navy, assured him (Dr. Carpenter), that if Sir James Ross had continued his search for another year, he would have lost the greater part of his crews from scurvy, for it happened that the lemon-juice at their command had very little value as an anti-scorbutic. They might administer citric acid and the alkaline salts, and the vegetable mucilage separately, but there was nothing like their natural combination in lemon juice: this combination being required to give those chemical products their highest efficacy as anti-scorbutics, just as the savoury principle of flesh was required to give the albuminous principle its nutritive value. But there was another point in which the living body was much beyond what chemistry or physics could account for. In the discussions which were going on with regard to the chemistry of food, and the mechanical equivalents of heat in the living body, there appeared to be a disregard of certain considerations which the physiologist knew to be of most essential importance. He need not dwell long upon the point of the constant waste going on in the animal body, this having been already adverted to. The body required food to sustain itself even in a state of perfect rest, whilst no mechanical force was being exerted, except the force involved in the circulation of the blood and in respiration. There was a muscular power given forth in those actions, and there must be an equivalent of force produced, but that would be comparatively small. The human body when at rest, excepting that small consumption, was undergoing a constant waste, which had no reference to the necessity of keeping itself warm. This waste is the result of that continual decay of the tissues which is a necessary condition of vital activity, and food is required in the first place to repair its results and to maintain the organism in working order. When work of any kind is done, this causes a proportional addition to the natural constant waste of the body. But there was something beyond this which had not been touched upon. It was one upon which physiologists had been enlightened during the last three or four years by experiments, viz., that in order to convert the food into living tissues, there needs a large waste of the food itself, the operations of sanguinification and secretion requiring an immense consumption of food. He would give two illustrations of this—one from the vegetable and the other from the animal kingdom, which the experience of all would apprehend. What was the meaning of the fall of the leaf? It was, that the leaves of plants were parts of the vegetable organisation, which were the makers of the solid structure, by bringing together the elements of the food—the oxygen, hydrogen, carbon, and nitrogen,—which they convert into the material of the solid substance of the stem. By the leaves the material of the wood was produced, and in producing that material for the growth of the permanent portion of the fabric, those transitory organs went through certain series or phases of life, and when these were accomplished they were cast off. That process was going on in the animal body, since, for the maintenance of the muscles, and brain, and bones, there was a very rapid succession of formations of soft tissues, which performed important functions in the process of assimilation, and those were temporary, as the leaves—only, instead of lasting, like the leaves, for several months, they only lasted for weeks or days. Hence, in the animal body, this fall of leaf, as it were, is constantly going on. He had spoken of the constant waste going on in the animal body irrespective of the work done, which was necessary for the maintenance of the body, as a living body, and that amount of waste could be measured by the amount of excretion in animals deprived of food and not put to exertion. That regular amount, day by day, could be ascertained. It would vary according to the amount of heat it was required to produce, but that element could be rendered constant. It was found that if an animal was only supplied with that quantity of food, it gradually loses in weight. Hence the quantity of food required to replace this necessary waste, was a great deal more than the necessary waste itself. If an animal were supplied with only the number of ounces of waste, it would at last be starved. It was found that the surplus proportion was different in different animals; from 150 to 200 per cent. being the quantity of food required to keep up the waste of an animal as compared with the weight which the animal loses when entirely unsupplied; or, in other words, nearly as much again of food was required to sustain the body in full vigour, as is actually applied to the construction of its tissues. He would now pass on to some other considerations which he thought had not received due attention; there were various kinds of work done by a living body—not only mechanical, but also mental. Many eminent physiologists were disposed to agree with him, that the work of the brain was just as much a tax upon the forces of the body as the work of the muscles. The brain wasted in proportion to the amount of thought or excitement of feeling, and wasted as much as the muscles in proportion to the wear and tear it undergoes. This mental force could not be measured by pounds weight lifted one foot high. Still he held that the mental pound was as much the product of food as the muscular forces, and the consumption of a certain amount of food was as necessary to the maintenance of the working powers of the brain as it was necessary to the maintenance of the muscular portion of the frame. Therefore he thought it was a misappropriation of ingenious calculation to draw a parallel between the working of a steam-engine or a galvanic battery, and that of the human body. They might as well say that a steam-engine did not do the whole work of the coal used because a great part of its force went out another way. The mechanical equivalent of heat in a steam-engine might be disposed of in the production of electricity. In fact they did know that the passage of the steam from the funnel developed a great quantity of electricity, but it was not collected as a force in the steam-engine. So in this calculation, with respect to the quantity of work done upon a given amount of food, they could only estimate the mechanical equivalent of that food. They might make the comparison between the amount of labour done by an agricultural labourer at 9s. a week, and the quantity performed by a labourer at 18s. per week, for the conditions might be nearly or quite the same. They might compute the physical work done by one man with that done by another, that would be quite a legitimate comparison, but it was not legitimate to compare what could be done by one man with a certain quantity of food with the work done by a steam-engine with the like amount of combustion. He would just state one point that was brought under his notice with regard to the influence of diet in connection with confinement. This required careful attention, being one of the points in which chemistry could not help, but in which physiological experience might show what was needed. Sir John Forbes, when travelling in Ireland a few years since, had been struck with the prevalence of ophthalmia in the Union Houses; he was impressed also with the idea that this disease was the result of insufficient nutriment. Mr. Wilde, a celebrated occulist of Dublin, was instructed to enquire into the matter, and he came to a similar conclusion. At the request of Sir John Forbes, he (Dr. Carpenter) examined the dietary scales of several Unions, and compared them chemically, according to the tables before the meeting, with the dietaries of the English poor houses; as regarded the amount of nutriment, and also as to its variety, he found that the total amount of nutriment of all kinds was not inferior to that which prevailed in most of the Union-houses in this part of the kingdom; but there was a difference in this respect, it was very uniform—gruel, oatmeal, maize, and potatoes, morning, noon, and night, usually no meat of any kind, and no variety of vegetables. It might be said this gruel, and oatmeal, and potatoes was the staple diet of the people of the country, and that in point of quantity it was better than they would get out of the Union-house. Yet there was something in the confinement, in the physical and mental monotony, which was shown in the case of prisoners and persons in Union-houses. It was different with those who lived free lives out of the Unions. There was something in the surrounding conditions which insensibly produced a most important influence in this respect, and, therefore, he held that it was not only the quantity and the quality of the food, but also its variety, which should be strictly attended to in the provisioning of persons confined within narrow spaces, without change of thought or occupation for long periods of time,

The Rev. Dr. Booth, F.R.S., could not permit a statement of one of the previous speakers to pass without expressing his entire dissent from it. Dr. Playfair gave it as his opinion that the character of a nation depended on the quality of the food it consumed, and instanced, as a proof of this strange assertion, the difference between the Mahometans of India who eat flesh, and the Hindoo population who fed on rice. But this difference was to be attributed rather to the indestructible characteristics of race, than to any difference in daily food. The Mahometans of India being of Mongol or Tartar descent, while the Hindoos are indigenous to the soil. Again, the Jews have had every variety of climate and food for the last 2,000 years, yet they have not changed in physiognomy, nor have the characteristics of the race been affected. These inherent qualities were far more deeply seated than Dr. Playfair imagined. Were it otherwise, questions of government and of reformation would be much simpler than they are found to be. We must not ignore the concurring evidence of all history, ancient and modern, should it stand in the way of an untenable and ill-considered theory.

Mr. P. L. Simmonds said that the physiological, chemical and mechanical aspects of the subject under discussion, had been so ably and justly spoken to by the scientific gentlemen who had preceded him, that he should probably best consult the views of the meeting by confining his observations to another phase of the question, the commerce and production of food, especially that of animals, with which he had lately been dealing in some of the agricultural publications with which he was identified. So late as Monday last, in a leading article of the *Mark Lane Express*, following with a series of papers on the importance of the dairy products, he had shown how largely cheese of home and foreign production was used as a food and condiment, and how important were its dietetic properties. The economy of food viewed in its various relations was a subject too vast to be dealt with in one evening, or, indeed, in many evenings' discussion, for every investigation and inquiry opened up new matter for consideration and experimental research. At the very outset of the discussion we were met by the inquiry of "What is food?" for the substances which are used as such, or may be called in for the sustentation of the vigorous powers of the body, are most heterogeneous, and varied in different climes and among different people. And here the old adage would occur to us, that "What is one man's meat is another man's poison." John Bull, however, though a hearty feeder, was rather nice in his eating, and somewhat bigoted and intolerant in his food prejudices. He had no penchant for foreign delicacies, but adhered with tolerable pertinacity to the animal substances which had become proverbial as the characteristic viands of the nation; and yet every race—every people of the globe—had some peculiar food-delicacy, and these curiosities of food he was enlarging upon last week in a lecture. It at least proved the adaptability of man to local circumstances, and evidenced the bounty and wisdom of the Creator, who had diffused animal life so carefully over the globe, that it enabled mankind to derive nutriment from the most heterogeneous substances of fish, flesh, and fowl. If a man, arrived at mature age, were able to summon up before him in bodily shape, the various animals which had fallen a prey to his carnivorous appetite, to meet the daily demand for his two pounds of solid food, he would be somewhat startled at their number and variety, and it would require a Noah's ark to contain them. The adaptability of the stomach was extraordinary, and although we might not relish the frogs, and the snails, and the horse-flesh of the continent, the monkey's flesh, alligators, and their eggs, whale and seal-flesh, polecats, iguana, lizards, and such like, of America, nor care to feast with the Africans on elephants' trunks and feet, lions and tigers, roasted snakes and locust bread or soup, we should be equally loth, probably, outer barbarians as we are, to partake of the Chinese messes enumerated by Sir John Bowring—of young puppies, cats and rats, sharks' fins and maws, sea-slugs, putrid eggs and edible birds' nests, or the fetid fish preparations of other Asiatics—dried mussels and prawns, and putrid fish pressed into a mass, with a "gamy" flavour to season their curries. However we might appreciate caviare and turtle, we should not care to taste the caviare of ant's eggs, so esteemed by the Mexicans, nor a slice of the sea-cow, eaten pretty generally in America, Africa, Asia, and Australia. There was no accounting for taste. But, apart from these novel articles of food, many of which would doubtless be gladly replaced by more wholesome substances were they at command, it cannot be concealed that there is a great waste of important articles of food in different localities, and also a great neglect in turning to practical application the important discoveries for the preparation and preservation of food which science has opened up to us of late years. It should be remembered, that the demand for animal food was increasing year by year, at home and abroad, and, as regards domestic live stock, scarcely keep pace with the increased means placed at their command by the large gold discoveries, and the more general diffusion of wealth. Every paterfamilias was conscious of the enlarged price of butcher's meat, and the daily wants of the mouths requiring to be fed. With all the increased exertions of our breeders and graziers, we yet had to import a large number of live animals, and a considerable quantity of cured provisions for the supply of our tables. The emigration of our population did not seem much to enhance our supplies; for, besides the diversion of labour from agricultural and pastoral pursuits in Australia, California, Canada, and other districts, the colonists became larger meat consumers. One instance, as telling directly upon our manufacturing interests, he might mention, namely, the check given by the gold discoveries to the former increase of sheep in Australia. While in 1852 there were six millions and a-half in the colony of Victoria, and the number had been increasing largely year by year, the want of pastoral labour and the demand for animal food had caused a decrease, and there were now scarcely 5,250,000 in the colony. Cattle-breeding had, however, increased, so as to meet the demand for animal food, and if we had less wool from thence, we might at least look for more hides. The preservation of animal food and the more general utilization of the food now neglected or wasted in the animals of the chase, the buffalos and wild cattle of North and South America, the wild sea-fowl and their eggs—the comparatively unreaped harvest of the fisheries, in various latitudes, were matters which he had prominently touched upon, two or three years ago, in a paper read to the members, for which the Society had done him the high honour of awarding their silver medal. The subject under discussion, as had well been observed, was not only of individual but of great national importance, nay, of interest to the world at large. The more, therefore, it could be ventilated—the more it could be examined—the more attention that could be paid to the nature, quantity, and quality of the food supplied to the people, the mode of cooking it, the means of preserving and storing it fresh for future use, and fitting it for transport to distant quarters,—the better would it be for the interests of society and of nations. Much remained to be done, and scientific investigations and popular discussion would do this by opening up new fields of research, and leading to new experiments and profitable and extensively beneficial results. The Great Creator had pronounced all that he made to be very good, but he left it to man to test, apply and economize the vegetable substances, and animals placed at his disposal.

Mr. Harries said, that as an officer of the Poor Law Board, the dietaries of Union-houses generally came under his observation; he could state that they had been formed and regulated upon data supplied by physiologists whose authority in such matters was unquestionable. He wished to ask Dr. Letheby whether he rightly understood him to say that the dietaries of prisoners were, generally speaking, more liberal than those of the inmates of Union-houses? His (Mr. Harries') experience was the reverse of that. In 1850, under the direction of Lord Ebrington, then Parliamentary Secretary to the Poor Law Board, he examined a large number of the dietaries in England and Wales, and the result was, to show an average of 22·16 ounces of nitrogenous ingredients per week, whilst he believed the prison dietaries on an average showed only 20 ounces weekly. He would remark that the general opinion appeared to be, that the dietaries of the Unions within the metropolis, were more nutritious than in the country; but he believed the fact to be, that the dietaries in the country around London were more liberal than the average of the dietaries in the metropolis.

Mr. Pittard said he was at present occupied as one of the officers of health of London. He thought the notice which had been given to the subject of scurvy ought not to be lightly passed over. There was danger, with persons not medically educated, of ranking the phenomena of scurvy with other ordinary diseases; but he would remark as a starting point on the subject of diet, that it was a singular fact that they might feed a man on capital diet, and give him plenty of strengthening food, and yet failing to give him fresh vegetables or their equivalent, he would fall into a wretched state of health. Mr. Pittard proceeded to give the result of his experience in various cases of the treatment of sea scurvy, and remarked upon the almost miraculous property of fresh vegetables, in effecting a speedy cure of that disease, giving instances within his own practice. He thought, with regard to the considerations of the health and well doing of the body, the natural tastes and instincts ought not to be wholly disregarded, but that within proper bounds much good frequently resulted from permitting their exercise.

Dr. Barnes was precluded, by the lateness of the hour, and by what had fallen from previous speakers, especially Dr. Carpenter, who had anticipated him, from going at any length into the subject. Dr. Letheby could not be fairly charged with dwelling too exclusively upon the fundamental element of food—time did not permit him to take in everything. It was, however, true that there were many elements of vital importance beyond those comprised in his Tables. Chemistry had not shown what the elements were that kept the blood in a healthy state, and prevented scurvy, but long before the recent advances in the physiology of nutrition, it was perfectly well known, empirically, how to prevent this disease. Captain Cook kept his crews in health by constantly procuring fresh vegetables, wild celery, and making beer with the tender tops of the spruce tree. With regard to the Crimean army, it was now well known that Dr. Andrew Smith had foreseen the necessity of providing lime-juice and vegetables, but our generals so managed that the men did not get them. There was one element of immense importance—iodine. He imagined Dr. Letheby must have made an error in quoting from Grange. Dr. Barnes believed that Grange, with Boussingault and Fourcault, did not attribute the origin of goitre and cretinism to the absence of magnesian limestone, but to the absence of iodine. It was ascertained that the wine of La Rochelle and the cereals of the Calvados, contained iodine, and that in those districts goitre and cretinism were unknown, whilst in some inland districts where the constituents of food contained no iodine, goitre and cretinism were prevalent. The quantity of iodine in our food must be infinitely small, yet it did not follow that it was not infinitely important. It had occurred to him that some of the value of guano might depend upon the iodine it contained. Salt had been adverted to by Dr. Letheby. He thought it possible that the salt we used was too much refined. It contained, he believed, no iodine. In some countries the salt was obtained from the evaporation of the sea-water; this might be more wholesome. The author had reflected upon the iniquity of taxing salt. It must, however, be remembered that not many years ago we taxed bread in this country; and we still taxed tea and sugar. Possibly the necessities of Government left no choice.

Dr. Letheby, in reply, expressed his gratification at the observations made by Dr. Lyon Playfair, whose chemical knowledge, as well as his special inquiries into this particular subject, gave great weight to the remarks which he had made. He was indebted to Dr. Playfair for the opportunity of showing, in a very clear and effective manner, the proportions of the several constituents of food in the dietaries of different nations, and of different classes of individuals, for the diagrams which were before the meeting were kindly lent for this evening by Dr. Playfair. Dr. Carpenter's observations were also entitled to great respect, by reason of the acknowledged eminence of their author; and there was but one point in those remarks to which he would refer. Dr. Carpenter stated that he thought it was a misapplication of ingenious calculation to parallel the working power of an engine and that of the human body, because we knew nothing of the actual power of the mental operations. The object of the comparison in the paper was not to show that we could estimate the actual amount of power exercised in the human body, but merely to show that of a large amount of developed power, only about $\frac{1}{14}$ was available for common labour. Now the intentions of the illustration were, first, that in demanding a certain amount of labour from a working man, we must take care that he is supplied with a quantity of food which experience shows is necessary for the performance of that work; and on the other hand, in furnishing a certain proportion of food to the convict, we may expect, if not demand, the equivalent of it in labour. The physiological relations of the question were purposely avoided, and the real or practical alone considered. In answer to Mr. Harries, who thought that there was an error in the conclusions deduced from the dietaries of prisoners and paupers, he would say that he had gone carefully over all the accessible dietaries of the two classes, and the general results were those indicated in the table. There were, however, great differences in both the quality and nutritive values of each class of dietaries, indeed, in the case of the dietaries of the county and borough gaols of England, there seem to be no rule observed beyond the mere fancies of the justices and magistrates of the different districts—and there was a like want of guiding principle in the construction of the pauper dietaries. To Dr. Barnes he replied, that he had misunderstood the tenor of his remarks on the subject of goitre and cretinism. Dr. Barnes thought it was urged that the salts of magnesia were wanting in the districts where those diseases were found, but the opposite was the case, namely, that there was a remarkable excess of those salts in the waters of those districts; and that, as there was no other circumstance common to the widely separated districts of those diseases, it had been thought by Dr. Grange that an excess of magnesian salts might have something to do with the production of the maladies. The remedy proposed by Dr. Barnes, namely, the use of iodide of potassium, was the remedy recommended by Dr. Grange, who advised that it should be mixed with all the salt sold in the districts.

Sir CHARLES FOX remarked, that through the means of these researches they might be able to arrive at the point when they could say, if they gave a man so much food, they might get a certain amount of work out of him. The present greatness of England depended upon the industry and labour of the people, and also from the fact that this country possessed a greater amount of machinery than any other. The brains and energies of Englishmen had been devoted to the improvement of machinery, but they had thought very little of the best mode of feeding a man to get the most labour out of him. It had been his lot to employ a great amount of labour in different parts of the world—in Spain, France, various parts of Germany and Scandinavia—and he had found that he never got so much labour out of any men as out of English workmen. On making inquiries with regard to the diets of different nations, he had come to the conclusion that this did not arise from superior talents on the part of the Englishman, but from the fact that, in France and Germany, the workman was not so well fed as in England. Although skilled labour fetched a higher price in London than in any other part of the world, yet the employer of labour found that nowhere could he expend his capital so profitably. It was a great moral question to see the human family well fed and well prepared to perform the important duties allotted to the human race.

The CHAIRMAN said, before performing the most pleasing part of his duty this evening, he would simply express a hope that some practical results would follow what they had heard that evening. He did hope with regard to the unfortunate aged poor, whose last refuge was the workhouse, that on economical motives—if for no higher sentiment, the old men and women might have their comfortable cup of tea or coffee. He did hope, too, that our great department of the philosophy of food—the prevention of waste—might be taken into the consideration by the ladies who had honoured them with their presence—particularly with regard to the instruction of the wives of the weekly-waged classes, to whom a knowledge of the principles of preparing wholesome food was most important. He quite agreed with the remark which fell from Mr. Pittard as to the value of the instinctive desires and longings. He had known healthy young people, after exertion of their muscular powers, express their very natural desire for cheese, and he had seen it refused by well-educated mothers as an improper article to be given them. Caseine was the substance which produced good muscular fibre in the human frame, and, in moderation, was one of the most healthy things a child could eat. He begged now to perform the very pleasing duty of asking the meeting to join him in a vote of thanks to Dr. Letheby for his admirable paper.

A vote of thanks was then passed to Dr. Letheby.

On the table was placed a great variety of preserved provisions, consisting of meat, soup, fish, vegetables, fruits, milk, bread, biscuit, egg, &c., contributed by Messrs. Brand and Co., 11, Little Stanhope-street, May-fair; John Henry Gamble, Morrisson's-quay, Cork; D. Hogarth and Co., Aberdeen, and 78, Cheapside; F. King and Son, 1, Bishopsgate-street; W. R. Mark, Spitalfields Market; John McCall and Co., 137, Houndsditch; Thurgar and Co., Albion Mills, Norwich; and G. Warriner, 38, Finsbury-square; to whom the thanks of the Society are due.

The Secretary announced that on Wednesday evening next, the 25th instant, a Paper by Mr. Christopher Dresser, "On a New System of Nature Printing," would be read.

MEETINGS FOR THE ENSUING WEEK.

MON. London Inst., 7. Rev. H. Christmas, "On the History and Antiquities of Heraldry; and on some other branches of British Archæology."
Architects, 8. Mr. J. G. Crace, "On Furniture, its History and Manufacture."
Geographical, 8½. I. Mr. Consul H. K. Abbot, "Journey in Persia from Shiraz to Darab and Kazeran." II. Mr. S. Sidney, "Proposed Search for Leichhard's Missing Party." III. Return of the North Australian Expedition under Mr. Gregory, to the East Coast." IV. "Chronological Table of the Earthquakes in the West Indies," &c. By M. Andrés Poez.
TUES. Royal Inst., 3. Prof. Huxley, "On the Principles of Natural History."
Meteorological, 7. I. Mr. Radcliffe, "On the Meteorology of Sinope." II. M. Poey, "On the Effects of Lightning in Connection with Photography." III. Mr. Glaisher, "On the Recent Hail Storms."
Civil Engineers, 8. Renewed Discussion on "High Speed Steam Navigation and the Relative Efficiency of the Screw Propeller and Paddle Wheels;" and, if timo permits, Mr. F. R. Conder, Assoc. Inst. C.E., "On the Permanent-Way of the Bordeaux and Bayonne Railway, across the Grandes Landes."
Med. and Chirurg., 8½.
Zoological, 9.
WED. London Inst., 3. Mr. E. W. Brayley, "On Mineralogy and Crystallography."
Society of Arts, 8. Mr. Christopher Dresser, "On a New System of Nature Printing."
Geological, 8.
Archæological Association, 8½.
THURS. London Insti., 3. Rev. C. Boutell, "On the Fine Art and Antiquarian Departments of the Crystal Palace."
Royal Inst., 3. Prof. Tyndall, "On Sound."
Royal Society Club, 6.
Antiquaries, 8.
Royal, 8½.
FRI. Royal Inst, 8½. Mr. R. Warington, "On the Aquarium."

SAT. Royal Institution, 3. Prof. Phillips, "On the Limits of Variation in the State of the Globe—Geological Force and Time."
Medical, 8.

PATENT LAW AMENDMENT ACT.

APPLICATIONS FOR PATENTS AND PROTECTION ALLOWED.

[*From Gazette, March 13th*, 1857.]

Dated 19th February, 1857.

483. George Frederick Lee Meakin, 40, Albion-street, Hyde-park—An improved method of applying breaks to railway carriages.

Dated 23rd February, 1857.

520. Edward Robert Wood, Stouthall, Swansea—Improvements in labels.
522. Charles Alexis Bourdier and Victor Masselon, 4, Trafalgar-square—Improvements in obtaining and applying motive power.
524. James Brown, Aldgate—A method or methods of preparing paper to enable it to receive an impression from an engraved block or plate, type, or other printing agent, while in a dry state.
526. Giuseppe Devincenzi, Maddox-street—Improvements in producing figures and designs upon plates for printing from.
530. Charles Henry Murray, Oakley-cottages, Old Kent-road—An improved construction of chain pump.
532. Aimé Koch, Belfast—Improvements in machinery for breaking and scutching flax, hemp, and other fibrous substances.
534. George Barnett, 102, Aldersgate-street—Improvements in fasteners for parts of garments.

Dated 24th February, 1857.

536. Claude François Latruffe, 39, Rue de l'Echiquier, Paris—Improvements in heating apparatus.
538. Stephen Wright Hawks, Gateshead Iron Works, Gateshead-upon-Tyne—Improvements in railway chairs.
540. Joseph Robinson, Glasgow-terrace, Thames Bank, Pimlico—Improvements in the stages used in green-houses and hot-houses.
542. John Pullar and Laurence Pullar, Perth, N.B.—An improvement in the manufacture of umbrellas and parasols.
544. George McCallan, Johnstone, Renfrew, N.B.—Improvements in air and water discharge apparatus for steam pipes.
546. James Thornton, Belfast—Improvements in the manufacture of bricks, tiles, and tubes of earthenware.

Dated 25th February, 1857.

548. William Wood, Monkhill-house, near Pontefract—Improvements in machinery or apparatus used in the manufacture of carpets and other pile fabrics.
550. Job Mead and George Mead, Bethnal-green—Improvements in metallic packing boxes or cases.
552. William Edward Newton, 66, Chancery-lane—Improved machinery for making preparings from waste silk, cotton, wool, flax, hemp, and other fibrous materials. (A communication.)
554. Christian Schwedersky, Railway-place, Fenchurch-street—Improvements in floating ships or vessels.

Dated 26th February, 1857.

561. Thomas George Shaw, 35, Great Saint Helens, Bishopsgate—An improved thrashing and winnowing machine, which he calls flail thrashing machine for corn and other grain.
563. David Owen Edwards, Cambridge-villa, Gilston-road, West Brompton—Ventilating and removing the products of combustion of fuel and of respiration from the apartments of dwelling-houses and from public buildings.
565. Andrew Peddie How, Mark-lane—Improvements in machinery or tools for drilling and boring.
567. Joseph Slatterie Edwards, 233 and 234, Blackfriars-road—The preparation and novel application of a certain foreign fruit or vegetable as an article of food, confectionery, or to be used in brewing or distilling, or for the manufacture of sugar and gum.
569. Brook Hodgson and John Carter, Halifax—Improvements in looms for weaving Brussels carpets and other terry fabrics.
571. Walter Macfarlaine, Glasgow—Improvements in moulding or manufacturing cast-iron pipes.

Dated 27th February, 1857.

573. Godfrey Ermen and Francis Spencer, Manchester—Improvements in the manufacture of bands, straps, or belts, for driving machinery, and for other purposes.
575. William Robertson and James Guthrie Orchar, Dundee, and John Menzies, Ordie Mill, Perth—Improvements in machinery or apparatus for winding yarns or thread.
577. Edward Mucklow, Bury, Lancashire—Certain improvements in apparatus to be employed for the purposes of cooling and evaporating.
581. Samuel Draper, Lenton, Nottingham—Improvements in apparatus for retarding and stopping carriages on railways, and in cocks or taps used for such and other purposes.
583. William Edward Newton, 66, Chancery-lane—Improved valve gear for reciprocating steam engines whose power is applied directly by the piston without employing a rotary shaft. (A communication.)

Dated 28th February, 1857.

585. Edgar Heale and Mary Ann Heale, Albion-terrace, Hatfield New-town, Hertfordshire—The treatment of vegetable and other substances.
587. Jesse Briggs, Newsted Mill, Pudsey, near Leeds—Improvements in looms for weaving.
589. Thomas Horton, Birmingham—An improvement or improvements in the manufacture of mottled or variegated soaps.
591. James Edward M'Connell, Wolverton—Improvements in railway breaks.
593. Peter Armand le Comte de Fontainemoreau, 39, Rue de l'Echiquier, Paris—Improvements in window shutters. (A communication.)
595. Richard Archibald Brooman, 166, Fleet-street—An improvement in the manufacture of sulphate of soda. (A communication.)
597. Theodore Hyla Jennens, Hunters-lane, Birmingham—A new or improved manufacture of rollers or cylinders for printing fabrics.

Dated 2nd March, 1857.

599. Samuel Wright, Halstead, Essex—Improvements in gas regulators.
601. Thomas Parker, 34, Sitwell street, Derby—Improvements in railway wheels.
603. William Pedder, 4, Savage-gardens, Tower-hill—Certain improved methods of strengthening metallic and other structures.
605. William Henry Smith, M.D., Philadelphia, U.S., now of London, James Cadman, Maestig, Glamorganshire, and Joseph Cadman, Sandersfoot, Pembrokeshire—An improved method of manufacturing solid and hollow bricks, pipes, and other hollow and solid ware, from clay, shale, and other mineral substances.
607. Frederick William Mowbray, Bradford, Yorkshire—Improvements in weaving.
609. Charles Pauvert, Chatellerault, France—Certain improvements in manufacturing cast steel.
611. William Poupard, Wych-street—An improvement in buttons and means of fastening buttons to garments and fabrics.
613. David Patridge, Woolwich—Improvements in steam boilers.
615. James Anderson, West Bromwich, Staffordshire—An improvement in the process generally termed "gathering," used in the manufacture of certain kinds of glass.

Dated 3rd March, 1857.

619. John Banks, Northampton—A new description of life-preserver, adapted also to the preservation of property.
621. Georges Danré, Pierre Fortuné Victor Mouillard, and Pierre Adrien Mercier, Paris—An improved method of, and apparatus for, heating by gas.
623. Thomas Ball, Nottingham—An improvement in the manufacture of warp fabrics suitable for the manufacture of gloves.
625. William Edward Newton, 66, Chancery lane—Improved machinery for removing snow from railways. (A communication.)
627. William Taylor, How Wood, Renfrew, N.B.—Improvements in the manufacture of iron and steel.
629. Robert Mair, Edinburgh—Improvements in apparatus for protecting articles worn on the person.

INVENTIONS WITH COMPLETE SPECIFICATIONS FILED.

647. Thomas Burstall, Southall, Middlesex—Certain improved machinery for manufacturing bricks and tiles from clay alone, or mixed with other materials.—5th March, 1857.
674. George Philcox, 7, Stebon-terrace, Stepney—Improvements in marine and pocket chronometers and other time keepers.—9th March, 1857.

WEEKLY LIST OF PATENTS SEALED.

March 13th.

2149. Christopher Hill.
2155. Cornelius Ferguson Clements.
2171. Joseph Gilbert Martien.
2203. Edward Finch.
2655. Hugh Baines.
2671. William Green, jun., and Thomas Storey.
2984. Alfred Vincent Newton.
130. Matthew Andrew Muir and James McIlwham.

March 17th.

2172. Robert Burns.
2174. David Crichton and James Cathcart.
2175. John Barber.
2178. Alfred Lodwick Newman.
2182. John Muir Hetherington and James Gee.
2190. William Frederick Plummer.
2193. Charles Goodyear, jun.
2194. Jean Baptiste Honoré de Roussen.
2106. Charles Frederic Vasserot.
2198. Pierre Laffitte.
2213. Thomas Webster Rammell.
2215. Alfred Ford.
2216. George William Sayer.
2239. William Beatson.
2244. Joseph William Wilson.
2326. Charles Durand Gardissal.
2381. Robt. McConnell and Alexander Mackenzie.
2563. Edward Joseph Hughes.
2983. William Edward Newton.
2999. George Miller Clarke.
23. Nicolaus Chas. Szerelmey.
180. Thomas Kitelee.

696. Nathan Appleton Dyar, Massachusetts, U.S.—A new and useful composition to be applied as a covering to the sides and roofs of buildings, and for various other purposes.—9th March, 1857.

PATENTS ON WHICH THE THIRD YEAR'S STAMP DUTY HAS BEEN PAID.

March 9th.

684. Frederick Seiler.

March 10th.

576. Peter Armand le Comte de Fontainemoreau.

March 11th.

598. Lawrence Whitaker, John Diggle, and George Howarth.
603. Edward Haeffely.
910. Henry Brown.

March 13th.

629. Robert Weare.
641. George Harman Barth.

March 14th.

637. Rice Williams Harris and Thomas Patstone.

Journal of the Society of Arts.

FRIDAY, MARCH 27, 1857.

NOTICE TO CANDIDATES.

Persons who intend to offer themselves as Candidates at the Society's Examinations in June next, in London and at Huddersfield, are desired to take notice that no one will be admitted to the Examinations who shall not have sent in his "Return paper" to the Secretary of the Society of Arts, before Monday, the 20th of April next.

EXHIBITION OF INVENTIONS.

The Society's Ninth Annual Exhibition of Inventions was opened on Monday last, the 23rd instant. The Exhibition will be open every day till the 23rd of May, from 10 a.m. to 4 p.m., and is free to the members and their friends. Members, by tickets or by written order bearing their signature, may admit any number of friends.

PRIZES FOR ESSAYS ON MARINE ALGÆ AS FOOD FOR MAN AND DOMESTIC ANIMALS.

The following are the conditions relating to the competition for the prizes of £50 and £20 respectively, placed in the hands of the Council of the Society of Arts by Sir W. C. Trevelyan, Bart., to be awarded for "The two best and approved Essays on the applications of the Marine Algæ and their products, as food or medicine for man and domestic animals. Competitors must give the results of their original investigations on sea-weeds (especially on the chemistry of their nutrient principles); and they must prepare a series of specimens illustrative of the best modes of collecting, preserving, and preparing the nutritive species in a state fit for food. Mere compilations will not be admitted to competition."

Conditions.

1. The Essays, with accompanying specimens, to be sent to the Society of Arts by the 31st day of March, 1858. Each Essay to be marked "Essay on Marine Algæ," and to have a motto or distinctive mark attached, which mark must also be written on a sealed letter, containing the name and address of the author.

2. The Essays will be delivered by the Council of the Society to the adjudicators, who will fix a day for making their award, which will be more or less distant, according to the number and size of the Essays.

3. The letters containing the names and addresses of the authors will remain with the Society of Arts, and none will be opened except those bearing the mottoes or marks attached to the Essays to which the adjudicators award the Prizes.

4. The adjudicators shall not be expected to give any reasons for their award, beyond stating that in their judgment the Essays are the best that have been submitted to them upon the subject, and are worthy of the Prizes, nor shall they be expected to give any opinion as to the soundness of any sentiments or theories which the Essays may contain.

5. When the adjudicators are prepared to make their award, a special meeting of the Council shall be summoned, and the Chairman shall then open the letters which bear the mottoes or marks attached to the successful Essays, and the Secretary will then communicate with the authors.

6. That in case the authors of the successful Essays shall be unwilling to print and publish the Essays at their own expense, then the copyright shall belong to the Council of the Society of Arts, who may publish the whole or any part of them, as they may think proper.

7. That the specimens accompanying the successful Essays shall be the property of the Society of Arts.

8. That the unsuccessful Essays, with the accompanying specimens, shall be returned to their authors when claimed, with the seals of the letters unbroken.

9. That the number of the adjudicators to be appointed by the Council be not less than five.

10. The Council reserve to themselves the right of withholding the prize entirely, in the event of the adjudicators reporting that in their judgment no Essay sent in is deserving of the reward.

⁂ Each Essay must be written in a plain legible hand, and only on one side of the paper, and it is recommended that it be as brief as is consistent with the importance of the subject.

SIXTEENTH ORDINARY MEETING.

Wednesday, March 25, 1857.

The Sixteenth Ordinary Meeting of the One Hundred and Third Session was held on Wednesday, the 25th inst., Captain L. L. Boscawen Ibbetson, F.R.S., in the chair.

The Paper read was:—

ON A NEW SYSTEM OF NATURE PRINTING.

By Christopher Dresser.

The art which I have this evening the honour of bringing before you, though new in the practical world, is not without its history, and although new in the sphere just named, perhaps claims a descent from bygone ages. Before, however, we notice the origin of this art, it behoves us to mark the signification of the term "nature printing" as that will define the path which we this evening must tread. The art of nature printing has been defined as "a method of producing impressions of plants and other natural objects, in a manner so truthful that only a close inspection reveals the fact of their being copies;"* but, to our mind, this is rather the result of its greatest achievements—to us it merely implies printing from nature, or with nature, and in this light we wish to regard it this evening.

As this printing from nature, or "nature printing," is only in one sense new, its history, or a brief statement of its supposed origin and progress, may prove interesting and useful, as this, and this alone, can enable us to understand to what extent it is new, and the nature of any supposed improvements or alterations in this art which may be offered. The precise origin of nature printing, the period when discovered, and the name of its first discoverer, does not appear to be handed down to us. Of this fact we are, however, assured, that as far back as about 250 years a simple mode of producing impressions of plants upon paper was employed by naturalists, which process must be said to be that of "nature printing" in its primitive form.

The earliest mode with which we are acquainted of producing impressions of plants was this:—The plant, after being dried, was held over the smoke of a candle or oil lamp, when it became blackened by a deposit of soot, after which it was placed between two sheets of paper and rubbed with a smoothing-bone, which caused the soot to leave the prominences of the leaf and adhere to the paper. In this way an impression of the plant was produced. This method of procuring impressions was employed as early as the year A.D. 1650.

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* See transactions of the Royal Institution. Henry Bradbury, on "Nature Printing."

History appears to be silent upon nature printing during the next 50 years, but in the year 1707 Linnæus breaks the silence by alluding to the impressions taken by Hessel, from nature, who, at a later period, in conjunction with a bookseller, carried out this art to a considerable extent, they even opening an establishment for the production and sale of works thus illustrated.

The mode adopted for the production of these works differed from that of the former, the leaf or vegetable subject being now prepared by being dabbed with printer's ink or lamp-black, after which, it was placed between two sheets of paper, and subjected to flat pressure.

A new feature was at this period introduced, viz., that of colouring by hand the impressions thus produced, which, however, did not prove successful, it usually obliterating to a considerable extent, and sometimes almost totally, the nature print.

Various other allusions we find to similar modes of producing impressions of plants, which we will not notice particularly, as they would upon this occasion serve no other purpose than to show the transition of the art in its simple form downwards to later times.

Hitherto all the modes of producing impressions of plants have been similar, they all involving a preparation of the botanical subject with a black pigment, and the application of pressure to procure the transfer. No attempt, that we are aware of, was yet made to multiply the impressions produced, a new vegetable subject being used for every impression, or nearly so.

In the year 1833 we have nature printing again appearing, but in quite a new form, and it will be at once seen, as we relate the process now employed, that it is altogether a new discovery, and cannot be considered as any modification of the processes before known.

The process to which we allude, and which is as follows, was the discovery of Peter Kyhl, a Danish goldsmith. The vegetable subject, after being thoroughly dried, and thus freed from all moisture, was placed between a plate of polished steel and a thoroughly heated lead-plate, which were unitedly passed between steel rollers, by which operation the plant became pressed into the lead, thus producing in this soft metal a beautiful concave image of itself; he also substituted zinc, tin, and copper plates for the lead, but their hardness proved an obstacle, as the pressure necessary to indent these metals was necessarily sufficient to distort the plant. Though we have here an art originated, of such a valuable character, it is not at present applied to any great practical purposes, as its ingenious discoverer died the same year that he made known his invention.*

During the next fifteen years various experiments were made in nature printing, but, with all their merit, they fell short of producing practical results. The next step worthy of our notice relative to the advance of this art was the proposal of a new method, conceived by Professor Leydolt, of the Imperial Polytechnic Institution of Vienna, in the year 1849, of printing from agates in such a manner as to represent themselves in a truthful manner. His method is as follows:—The agate is exposed to the action of fluoric acid, the result of which is, certain of the concentric scales are decomposed, while others remain unaltered; after this, the surface is well washed with dilute hydrochloric acid and dried, then carefully blackened with printer's ink. A piece of paper is now placed upon the prepared stone and rubbed with a burnisher, by which operation an impression is produced. There is one objection, however, to this simple process, viz., that the parts which are black in the stone are represented white, and the parts that should be white are represented black; this is, however, now overcome by the surfaces being reversed; that is, the concave surfaces made convex, and the convex concave, which is effected by casting.

Dr. Ferguson Branson, of Sheffield, appears to have suggested the next advance of nature printing, by the proposal in his paper, read in the year 1851, before the members of this Society, of the application of the electrotype, which has since proved itself to be an essential feature in this art.

Although Dr. Branson was the first to propose the application of the electrotype to this art, he afterwards abandoned this process, fearing that it was too expensive and tedious to answer practical ends, substituting for it brass casts. His process was that of taking casts of the vegetable object in gutta-percha, and electrotyping or casting from such moulds, in order to produce printing plates.

About the year 1852, Dr. Branson again made experiments endeavouring to render nature printing a practical operation, and the mode he now adopted was that of taking impresssions upon Britannia metal, with a view of transferring them to stone, and after printing in neutral tint, to colour such impressions by hand. This, however, failed to produce any practical results.

The next step was taken in the Imperial printing office of Vienna. It appears that specimens of the results obtained in England were received by that office in the year 1851, or early in 1852, and that they attracted the attention of the director, who resolved to produce in some way like results.

The first experiment there made appears to have been casting with gutta-percha, as Dr. Branson had done, but as this material did not altogether answer, Andrew Worring, in whose hands it had been placed, proposed the substitution of soft lead for the gutta-percha, which he used in the manner that Kyhl formerly did, and with great success; but the specimens operated upon were lace; hence, not natural, therefore this was not "nature printing." Professor Haidinger, however, proposed the application of the process to plants, which suggestion Worring gladly availed himself of. After he had prepared the moulds, in the manner just described, he, by the agency of the electrotype, produced plates prepared for the printing press. This process was at once applied to practical purposes, and several botanical works have already been illustrated by this agency. This process was first patented in Austria in the year 1853, and since in England by Messrs. Bradbury and Evans.

There is one other form of nature printing of which I am unfortunately to a considerable extent ignorant: it is the process of Felix Abate, of Naples, for producing representations of the grains of wood as exhibited by sections. The process depends in a great measure upon heat, but the date of this discovery I am not acquainted with.* This is, we believe, a sketch of the advance of nature printing from its origin and most simple state, to the present time, at which it has acquired not only a practical form, but wonderful perfection.

As we have passed along, we have noticed four distinct forms of nature printing; none of which could have been copied from either of the other forms of this art; the first being that in which the object was prepared by being blackened by some agency; the second, the impressing of vegetable objects into soft metals; the third, the preparation of minerals, so as to render them capable of producing images of themselves; and the fourth, the preparation of wood, so as to render it capable of yielding impressions which are its true image; these are the distinct varieties, and we cannot but believe that here we have the basework of an edifice which is daily being reared, and which will ultimately cast a benign influence, not only upon the sciences, but over the whole of mankind.

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* This process appears to have been used in some way, as impressions of plants, &c., were, we believe, produced from plates thus prepared.

* Since I wrote this the Secretary has kindly informed me that this process was described in the Journal of this Society. It had altogether escaped my memory where I had seen it, therefore I could not refer to it.

We have not only noticed in this short history the four distinct varieties of this art just alluded to, but various modifications of some of the varieties; this we wish, however, to impress: that it is not necessary that each one who followed out any branch of this art was acquainted with the works of those who preceded him, nor, on the other hand, can we say that he was ignorant of their researches. We would not for one moment rob any man of the laurels which he has justly won. We believe that Dr. Branson was the first who suggested the application of the electrotype process for the production of printing plates from casts from nature, but it does not follow that because Dr. Branson suggested it, that Worring of Vienna was acquainted with that fact; and although Worring adopted Kyhl's mode of pressing objects into soft metal, it does not follow that he was acquainted with the works of his ancestors. We do not say that he was not acquainted with these experiments—neither can we justly say that he was.

Mr. Henry Bradbury, in his paper on "Nature Printing," found among the transaction of the Royal Institution, states that we are indebted to Kniphof, for the application of the process in its rude state; to Kyhl, for having first made use of steel rollers; to Branson, for the first suggestion of the electrotype; to Leydolt, for the remarkable results he obtained in the representation of flat objects of mineralogy; to Haidinger, for having promptly suggested the impression of a plant into a plate of metal at the very time the *modus operandi* had been provided; to Abate, for its application to the representation of different sorts of ornamental woods on paper, &c.; and to Worring, for his practical services in carrying out the plans of Leydolt and Haidinger. From this statement we at once perceive that he supposes each man to have been acquainted with the works of those who had gone before him, otherwise he would have given each credit for the discovery of the art which he practised, but to our mind it is improbable that each was acquainted with the works of his ancestors, for had Worring been acquainted with the experiments of Kyhl, it is scarcely probable that he would have permitted the thought to remain so long unworked out, also the plan which he proposed was one which would readily suggest itself to a man in his capacity, with his practical knowlege.

Respecting the relative value of these discoveries we must just say a word. On those modes of nature printing which offered no power of multiplying impressions, save by a direct printing from nature for each impression, little need be said, as they are, in a practical point of view, worthless; yet these we would not depreciate; on the contrary, we would cherish them as seeds from which results of high practical value may ultimately spring, and they are for private purposes beautiful, interesting, and valuable.

The process for producing fac-similes of minerals, &c., having now the power of producing an unlimited number of impressions, is invaluable, as is also the process of impressing objects into soft metal, and by the agency of the electrotype preparing from such soft metal plates, those which will produce impressions to an unlimited extent; but of the power of this last process we must speak more definitely. Mr. Henry Bradbury, the champion shall we call him, of this modification of the art of "nature printing" in this country, states that if anything but a *thoroughly dried* vegetable specimen be placed between the plates of soft lead and steel, it will be spread in all directions and distorted to an unlimited extent, without leaving any impression in the soft metal, save a most undesirable one; therefore, the use of *thoroughly dried* specimens, and those only, is a necessity of the process. To this drying there is this objection: that the texture, which often furnishes the most distinctive character of a plant, is frequently altogether destroyed; this objection is, unfortunately, somewhat formidable. Also the ordinary results of the process seem to indicate that an extremely hard and thick outline to the body depicted is also a necessity of the process, but we cannot see any reasons why this may not ultimately be removed. One other objection to this process is this; that the pressure necessary for the formation of the impression frequently shatters the specimen, the results of which are oftimes amusing; thus we remember, while perusing a folio of these productions, hunting all over the sheet of paper on which the object was printed to find the constituent parts of certain leaves of the plant there depicted. This is an objection which will always remain as a difficulty when tender plants are used, but which will not be felt when strong subjects such as ferns are operated upon. Having thus looked at the dark side of the question we turn the page over and look at the bright side, and we say that the triumph of this process consists in the just and beautiful way in which it represents the venation of vegetable objects, it often presenting perfect copies of leaves which are possessed of veins of almost microscopic fineness.

Having thus noticed the modes of nature printing at present known, and their relative value, we must enter upon the special object of this evening's meeting, viz., that of introducing a new process of "nature printing," or a new branch of this art, and we may say that we feel it a special honour to stand before this meeting upon such an occasion as the present, as in this institution Dr. Branson uttered his valuable suggestions which were taken up so warmly by the members of this Society.

The plan which we beg to propose is that of using any natural object, a leaf, or flowers for example, as a printing surface, and printing with it on a lithographic stone, or metallic plate or cylinder, and after subjecting them to the usual processes for rendering them fit for printing, taking impressions in the usual ways,*

The precise mode of procedure is as follows:—

1*st. The Lithographic Process.*

"We take a leaf, for example, and carefully dab it with lithographic ink, (which has been reduced by water to about the consistence of printers' ink,) by the agency of a dabber, which is made of fine soft muslin filled with cotton wool. To enable us to coat the leaf evenly with ink, a small quantity of the latter is placed on a piece of damp writing paper, which rests upon several sheets of damp paper or cloth, under which is situated a warm metallic disc, or warm water-trough; the object of this contrivance being to keep the ink in the required plastic condition. Now, by the agency of the dabber, the ink is spread evenly but thinly over the sheet of writing paper, and the leaf to be reproduced is placed upon it. The leaf is now dabbed with the ink dabber, the latter being renewed with ink from the surrounding paper, taking care not to have too much on the dabber. Having now prepared the leaf by giving it a thin and even coat of ink, it is placed with the prepared side downwards, on a lithographic stone which has been previously warmed so as not to "set" the ink upon the leaf. A sheet of paper is then laid over the leaf, and rubbed with the finger or with a soft pad, which presses the leaf in contact with the stone. Now, upon removing the paper and the leaf carefully, we have our impression upon the stone. The stone is now subjected to the usual lithographic processes, as if it were a drawing, and copies produced by the ordinary lithographic printing process."

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* This process was patented Dec. 22, 1855, and this description is extracted from the specification.

2nd. The Metallic plate process, printing from a raised metal surface like a wood-cut or type.

"We take a leaf and prepare it in the same manner as that just described, substituting, however, for the lithographic ink a composition made by melting together about equal quantities of "etching ground," "common tallow," or "Balsam of Judea" and "sweet oil" (or any like substances), which are well mixed by being rubbed on a slab with a pallet knife, and a porcelain or metallic plate for the sheet of writing paper, which plate is placed over warm water and coated with the composition described, by the agency of the dabber; the leaf is now prepared by being dabbed, in the above described manner. Having now prepared our leaf, it is laid upon the metallic plate, zinc for example, which has been slightly warmed. A piece of paper is now placed over the leaf and rubbed as before. Upon removing the paper and leaf we have a true impression of the latter upon our plate, therefore, all that now remains to be done is to remove the metallic ground surrounding the impression and intervening between its parts, which is accomplished by the well-known etching processes, as that of employing dilute acids, or by the agency of galvanism—the latter is preferable—one variety of which, adapted to our purpose, is fully described in the *Athenæum* of March the 8th, 1856. We now, having our plate engraved, and having a true image of the leaf convex, print it off as if it were type or a wood engraving."

3rd. The ordinary copper plate or cylinder process, the engraving being concave.

"We take a copper, or other metallic plate, and thinly coat it with "etching ground," just as if it were about to be etched upon. The leaf is now prepared by being dabbed with oil paint—that used by artists—which has been spread over a sheet of paper by the dabber; from this the latter is replenished with colour as above described. After dabbing the leaf we place it upon the etching ground, and lay a piece of paper over it, and rub it as before. We now remove the paper, and in about one minute the leaf also. Now where the oil paint has touched the "etching ground," the latter is dissolved, and is at once carefully wiped off with a soft rag, the copper now appearing through where the ground is removed. The plate is now washed with soap and water to remove all remaining grease, and then subjected to the usual etching processes. In this case the image of the leaf is concave, and is printed off by the usual copperplate printing process. When rollers or cylinders are employed instead of plates, the process followed is similar."

Having thus described in detail the process now proposed, we may perhaps be permitted a word on the origin of the thought and the progress of that thought to its present state. When quite a schoolboy a person showed me a book containing a number of black impressions of leaves, but he was unfortunately not possessed of sufficient generosity to enable him to impart the secret of the mode of their production, although its retention was to him of no value. With the usual determination of youth not to be outdone, a resolution was made to invent some plan of producing similar results. Just about this time a friend placed in my hands a small portion of some popular periodical containing directions for taking impressions of leaves, which were as follows:—"Oil a piece of paper, then smoke it over the flame of a lamp and rub the leaf upon it, after which press the leaf thus prepared between two pieces of paper." The experiment was tried, and although to an extent satisfactory, was not altogether congenial, as the process was not a very easy or cleanly operation. Perceiving that a leaf was capable of being blacked, and of thus yielding impressions, the operation was altered; a composition of lamp black and sweet oil was prepared, which was evenly spread over a sheet of foolscap paper by the agency of a dabber made of calico stuffed with cotton wool; the leaf was then placed upon the black paper and dabbed with the black dabber, which was replenished when necessary with black from the surrounding paper. These results became shortly so successful, that a book was prepared and a series of impressions of leaves thus produced, were duly mounted in it, and with a degree of pride the old friend was again visited who had before displayed the book of impressions. These new results were soon perused by the old friend, who immediately exclaimed, "They look like lithographs; how did you do them?" This was coming to the secret. A laugh was at first the only answer to his question, therefore an instantaneous offer was made of revealing the secret of the mode of production of the contents of the former book, if the secret of the production of the contents of the latter should be disclosed. The challenge was accepted, and after the process by which the latter had been produced was stated, the secret was revealed relative to the former, which was as follows:—The leaf was placed between two leather pads, such as are used by printers, which were coated with printers' ink, and after being duly dabbed, was pressed between two sheets of paper. It was soon learned that this was a common school-boy feat, and a feeling perhaps partially of outvieing, and partially of the value of such a process to a student of the Fine Arts, which was then my lot, led me to search for some way of producing similar results in colours. An attempt was made to substitute oil paint for the lamp black, but at first unsuccessfully; it was therefore given up as a failure. After the lapse of four or five years the process was again recurred to, and this time oil paints were used with success, when it was found that a little skill in manipulation was all that was necessary in order to produce satisfactory results. During the five years which elapsed between the first and second series of experiments, lithography had come under my notice; therefore, the substitution of lithographic ink for the substances formerly used, and of a lithographic stone for the under sheet of paper, readily suggested itself. This proposition was named to Dr. Playfair, who, from the results obtained with the oil paint, had no doubt of the success of the process proposed. Experiments were therefore commenced, which proved highly satisfactory. Upon the success of the results at this time obtained, Dr. Playfair suggested the patenting of the process while further experiments were being carried on. He then suggested the preparation of the leaf with a composition which should resist the action of acid, and printing upon metallic plates, cylinders, &c., which should then be etched by the ordinary processes. Experiments upon this branch of the art were immediately commenced, and Mr. Warren de la Rue kindly consented to carry out these experiments by etching the plates. However it was found that the ordinary mode of etching by acids did not answer, as before the ground was eaten away sufficiently to enable the convex figure of the leaf to be printed from as a wooden block, which was the intention, the finer parts were destroyed by the lateral action of the acid. The electrical etching was therefore resorted to, and the results thus obtained were highly satisfactory. The first specimens ever produced by this method are here before us. Other experiments were made, endeavouring to eat off by the agency of oils, "etching-ground," from a plate which had been covered with this substance, and then etching in the ordinary way so as to use the plate as an ordinary engraved copper-plate, the image being concave; but relative to the success of this process we can say little, as the results are at present to an extent uncertain.

This method of producing similar results seems, however, to bid fair for success, viz., that of taking the impression of the vegetable object in grease, upon a steel plate, and etching it, not very deeply, by electricity, then pressing this etching into soft copper (as is done in the preparation of cylinders for Calico printers,) after which the etching on the copper-plate or cylinder is deepened by the ordinary re-etching process.

It will be seen, from the statement of our processes here given, that we employ, as a primary thought, methods for producing images of vegetable structures long known; nevertheless ignorant as it may appear, I was totally ignorant of all other modes but my own, till Dr. Playfair called my attention to what had been done. Had I been introduced as a stranger to the two processes now patented in England, just before I learned the history of nature printing, I should have said that the earlier originated in the school-boy trick of copying seals by laying soft lead over a sealing wax impression and hitting it with a hammer, and the latter from the feat of dabbing leaves with printers' ink, performed by the same community. Let it not, however, be supposed that I claim the original thought, for as we have before seen, it was given by the works of a former experimentalist, the new feature proposed being merely a mode of multiplying impressions.

Various proposals were made for producing full colours, and light and shade, in these impressions; thus, hand blocks, &c., have been applied to the nature prints for this purpose; but these are deviations from the purport of this evening.

Relative to the capabilities of the processes now before us, we believe that they are greater than those of any other branches of this art. The power afforded of using living specimens, rather than dried ones, enables us to secure the true texture of the leaf, the impressions revealing at a glance whether the vegetable object was glabrous, or rough, or downy, hairy, &c., and impressions are thus produced which show every hair of the copied leaf; the power, however, is not denied of using specimens imported from abroad, for dried specimens are as easily used as others, but they necessarily yield the dried effect which can, however, be to an extent overcome in this process by wetting the leaf. This power is also afforded, which is one which must be admitted to be beyond the reach of all other processes, viz., that of producing impressions of such delicate things as the cells of plants.

We have taken the section of plants possessed of large cells, and produced impressions of them with almost the fineness of the original; the germination of the seed, the flower and the fruit of certain plants, we have been successful with. We need not state that there are some things which we cannot copy, but our present achievements will be admitted to be invaluable, especially the production of true images of natural objects convex upon a metallic plate, capable of being printed from in the ordinary type press.

A word must be said upon the cost of the process, as this necessarily influences the commercial value of all discoveries. Respecting the lithographic method, the whole expense may be said to be that of printing off the impressions, as the cost of the materials for one transfer of a leaf on to the stone is less than one half-penny, and the time necessary for producing the original figure on the stone is a few minutes. Both the other modes are about as speedy, with the exception of the etching, which, occupying rather more time, involves a little more labour and expense, which are, however, more than compensated for in the process for printing from raised copper figures, as the expense of printing off impressions is in this case extremely small. Owing to the durability of the blocks employed, the most expensive form of the process must be below that of the process at present employed.

I cannot conclude without thus publicly thanking Dr. Playfair for his great kindness in enabling me to bring out this subject, as well as for furthering my humble thoughts, relative to this and all other matters on which I have asked his aid; Mr. Warren De La Rue, for carrying on my experiments on metallic plates; Mr. Richard Redgrave, for valuable hints upon etching; both Sir William and Dr. Hooker, for supplying botanical specimens; and the Department of Science and Art generally, for much assistance. Only for these aids my endeavours must have been vain.

DISCUSSION.

Sir CHARLES FOX said that although, perhaps, a little wide of the subject before them, he might be permitted to mention that, somewhere about thirty years ago, a mode of making casts by means of elastic moulds was laid before the Society by his brother, Mr. Douglas Fox. The first casting was that of a stag's horn, made of a mixture of wax and white lead. The casting was sent to the Society of Arts, and by that Institution to Mr. Deville, one of the most celebrated casters of the day, who expressed a strong doubt with regard to the truth of the statement—that the casting was made from a mould having only two parts. In order to settle that question it was resolved to make another mould of this stag's horn, and to invite Mr. Deville to take the casting out of the mould himself. The mode of casting was this:—He took the stag's horn, and also some ordinary sewing-silk, which was dipped into melted glue; this was stuck lengthwise round the horn, in the line in which it was intended to divide the mould, and the glue was allowed to set. Then putting a fine coating of oil over the horn in every part, a quantity of glue was melted, and the horn was suspended in it, and it was left until it was cold; then, by means of withdrawing the sewing-silk, the mould was cut into two parts in the most perfect manner. The mould itself was then placed in a vessel of ice, in order to harden and cool it as much as possible, inasmuch as, the casting being of wax and white lead in a heated state, the glue mould was liable to be destroyed by the heat; when the mould was quite cold the ingredients for forming the casts were poured in, and in a moment afterwards turned out again, leaving only a thin coating of the wax and white lead inside the mould. This preserved the mould from injury by heat, and by repeating the process a cast of any desired thickness was obtained. This was sent in the mould to Mr. Deville, who took it out himself, and upon his report of the beauty and value of this process the Society awarded to Mr. Douglas Fox the large silver medal for his invention. While on the subject of experiments in casting, he (Sir Charles Fox) would mention some that he had made for the purpose of obtaining moulds from leaves so as to be able to print from them; and some very beautiful results were obtained. The process adopted was a very simple one. He took an open receiver of an air-pump, and placed upon it a slab of porous stone, previously dipped in water, and a partial vacuum having been obtained, a leaf also dipped in water, was then placed on the stone, and the slight pressure of the atmosphere laid the leaf down quite flat, but in a manner not to interfere with its delicate texture. A little plaster of Paris was then poured on the back of the leaf, then, by letting the air into the receiver, the plaster mould, with the leaf imbedded in it, could be removed. From this mould a second mould was taken, and then the ordinary stereotype plates produced, from which they could print in the manner of ordinary types, which it was well known was the cheapest mode of producing impressions. Now, in taking plaster casts from the delicate surface of a leaf, it was found to be very difficult to prevent the moulds being affected by air-holes, which in the casting produced what was technically termed by the stereotyper "picks." This difficulty was, however, surmounted in a simple way. It occurred to him that if he could cast the mould under water this might be remedied. He instantly acted upon the idea, and having mixed a small quantity of plaster of Paris, he placed it in water, and an hour or two afterwards he found that the plaster was a solid lump, having set under water.

He was thus enabled to cast his moulds under water, which were still somewhat imperfect from the effect of small globules of air; but, by the action of a little jet of water upon the leaf, an expedient suggested by his brother Dr. Fox, who called it a "water brush," the globules of air were instantly removed, and could be seen running away from every part of it. By this means he succeeded in getting moulds free from "picks," and by pouring the plaster upon the leaf while under water, the finest particles by falling to the bottom on to the face of the leaf, took an impression of very great delicacy. By this process he had taken castings of a Napoleon medal, and after ten consecutive operations, the last casting was nearly as perfect as the original.

Mr. Hanhart said he would confine his remarks more particularly to that portion of the paper which referred to manipulation upon the lithographic stone, and although giving Mr. Dresser full credit for the perseverance that had led him step by step to what he considered a new method of nature printing, he (Mr. Hanhart) must say that similar results had been arrived at before. They had probably noticed that the valentines exhibited in the stationers' shops, were often surrounded by a printed lace pattern, and when this kind of ornamentation was first introduced, now twenty or five and twenty years ago, these patterns were transferred without any drawing, from the lace itself. The mode of effecting it was to soak the lace in a solution of gum arabic; when nearly dry it was made to adhere to the stone, and lithographic ink was then passed over the whole surface, the gummed lace preventing the ink combining with that part of the stone which it covered. In this way the pattern was printed in white on a tinted ground; and though in this instance the pattern of the lace appeared in white, and the ground was made the printing surface, they would still see the bearing this method had upon the subject before them. The coating an object with lithographic ink and transferring it on stone, had also been done at various times, with more or less success. He (Mr. Hanhart) had seen last year in Paris a work on sea-weeds, consisting of a number of plates, which at first sight appeared to be produced by the process of nature printing, as practised by Mr. Henry Bradbury, but on close examination he found that it was a lithographic production, and was confident that the objects were made to transfer their image to the stone, in a similar manner to what had been shown that evening. Some of the plates of this work were very satisfactory; others were confused; the success evidently depending upon the peculiar nature of the plant, as is the case with the process when the specimen is made to impress its form and texture into a metal plate. Although reproductions of this kind were very interesting, yet when fair representations of a plant were required, recourse must still be had to a good drawing.

Mr. W. E. Newton had listened to the paper with great interest. He would, however, call attention to one or two omissions in it. The author had given a history of the art up to certain points, but he had not alluded to the experiments made by Mr. Wedgwood. Several years ago, that gentleman experimented upon the photographic process, and produced some very beautiful specimens from natural objects by the action of light. Mr. Dresser had also omitted to mention the more recent experiments made with daguerreotype plates, from which impressions could be printed.

Mr. Henry Twining remarked that upon examining some of the specimens on the table, he was struck with their delicacy and minuteness, compared with those exhibited in that room on a former occasion, and that delicacy probably arose from their being produced whilst the botanical specimens were moist, instead of in a dried state, as heretofore, and also from not having been compressed, which detracted from the softness and delicacy of the impression. The process here introduced, he conceived, would be of the greatest use for the illustration of botanical works, owing to its cheapness and the number of impressions that could be readily obtained. It would be useful also, he thought, to a certain extent, in supplying designs for ornamental art. He scarcely thought that the specimens on the table were adapted for that purpose, inasmuch as the great object was to produce copies of entire flowers and plants, rather than single leaves or parts of flowers, as in the specimens exhibited. If this could be accomplished, he considered it would be a great feature in promoting ornamental art of various kinds.

Mr. Pearsall said, that in the review of the nature-printing process the union of lithography with photography had been alluded to in terms of hope, but he did not gather whether the speakers viewed photo-lithography as a probability or as a possibility. He might, therefore, call the attention of those who were at the Glasgow meeting of the British Association, in Sept., 1855, to the full evidence of this having been accomplished in the two photo-lithographs at the Photographic Exhibition in Glasgow which excited much attention, and were so truthful that it required special examination to be convinced that they were not photographs. He believed that the subject was brought forward at the chemical section presided over by Dr. Lyon Playfair.*

The Chairman said that Mr. Dresser, in a most interesting manner, had shown the various methods that had been used to further so important a result as printing by nature, and which had brought the art to its present perfection, and many thanks were due to him for his researches. It was mentioned in a part of his paper, that during fifteen years, viz., from 1833 to 1849, no practical results were arrived at, notwithstanding various experiments. Perhaps a few specimens of some results brought out by him (the chairman) during these years, might not be uninteresting. In 1839 he happened to see one of the first daguerreotypes, and was immediately struck with the idea of the advantage of producing a similar result on paper as well as the being able to multiply them. He was then in Switzerland, and instantly set to work to make experiments on the subject. Professor Gerber, of Berne, was engaged also in the matter, with whom he put himself in communication, and partly adopting his method, and partly by his own individual experiments, succeeded in printing the book of plants now before the meeting; he therefore thought himself entitled to claim that (with the assistance of the Gerber method) he was the first to print by the sun. On showing this book to M. Arago, at Paris, he first learnt that Mr. Fox Talbot had just then taken out a patent on the same subject. He then turned his attention to engraving from nature, particularly by the aid of the oxyhydrogen microscope. In the September number of the *Westminster Review*, for the year 1840, two of his prints were inserted, the one a group of fossils on stone, showing the possibility of engraving from a drawing by nature of opaque and bulky objects; the other a madrepore, drawn in the oxyhydrogen microscope, and magnified twelve-and-a-half times. He next produced for the late Dr. Buckland, Dean of Westminster, in the short space of two days, a very minutely detailed drawing of a pentagonaster; and afterwards, a small perch, on copper, of its natural size. He then took one of the scales and enlarged it with the oxyhydrogen microscope, from $\frac{1}{10}$th of an inch to nearly four inches. He next attempted to make nature engrave as well as to draw. [The chairman here exhibited a small copper plate, which he stated to be both drawn and engraved by nature.] He considered that this result, though imperfect, showed that much might be done by further investigation. He had succeeded also in employing his new electrotype process for nature printing, but his researches were put a stop to by his being employed by government to make a geological survey of all the railroad cuttings in Great Britain. Lately, however, he had recommenced, and he hoped in a short time to bring before the public some novel and interesting experiments, in modelling and printing, &c., by nature combined with art. All these experiments, including the electrotype, were made between the years 1839 and 1844. The Chairman concluded by moving a vote of thanks to Mr. Dresser for the paper which he had read.

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* See the *Athenæum*, Sept. 22, 1853, p. 1093, where it is reported that a communication was made by Professor Ramsay, "On a Process for Obtaining Lithographs by the Photographic Process," this means having been employed by Mr. Robert McPherson, of Rome, to obtain the beautiful photo-lithographs in the Exhibition at the Buchanan-street Rooms. See also the report of the twenty-fifth meeting of the British Association, page 69.

A vote of thanks was passed to Mr. Dresser.

The paper was illustrated by a variety of impressions of leaves and flowers produced by Mr. Dresser's process.

The Secretary announced that on Wednesday evening next, April 1, a paper by the Rev. W. Rogers, "On the Trade, Habits, and Education of the Street Hawkers of London," would be read.

The Secretary has received the following letters, since the meeting was held:—

Sir,—Many of Mr. Dresser's processes are suggestive, and not without interest, but seem to me laudable endeavours to do, under difficulties, what has been better done before. As an artist, I may remark upon the great value of the process in affording natural forms for adaptation, and I trust that my friend Mr. Bradbury will some day give us a book of leaves with photographic portraits of the trees, a work that should form a text book, not alone to the botanist, but to artists of every class.

From the specimens of nature printed lace, exhibited by Mr. Taylor, of Nottingham, in 1851, to the Imperial Official Works of Vienna, there is a great step, but it was left to us to produce the most complete series of prints from nature yet obtained, I allude to the Ferns of Great Britain, from the Whitefriars Press, for which, I believe, the Emperor of Russia has just presented Mr. Henry Bradbury with a diamond ring.—I am, &c.,

JOHN LEIGHTON, Jun.

Sir,—Having been present last evening, on the occasion of Mr. Dresser's paper on "a New System of Nature Printing," allow me to make a few observations. It appears to me that this so-called new system presents no other feature than the reproduction, upon printing surfaces by modern scientific appliances, of a discarded result produced some 250 years back by a mere hand operation upon paper.

His endeavour is merely to perpetuate, by one or more printing processes, the simple but imperfect effect produced by the blacking a leaf with lamp-back or ink, and transferring the same to paper by hand-pressure. Everybody by this time is aware of the nature of this result—it may have served its purpose for a time—but, it will be acknowledged how imperfect and inadequate such a result is in this advanced age; and yet, Mr. Dresser comes forward with this as a new system of Nature Printing, not as a new result in the art. Mr. Dresser is content to retrograde, not to advance. He has also borrowed the early history of Nature Printing from my original paper on the subject, which appears in the transactions of the Royal Institution. Mr. Dresser also states, that in my having awarded merit to different individuals, such as Kniphof, Kyhl, Branson, Leydolt, Haidinger, Abate, and Worring, I must have supposed each man to have been acquainted with the works of those who had gone before him, otherwise, I should have given each credit for the discovery of the art which he practised. If Mr. Dresser had considered for a moment, he would at once have seen that the names of those men being placed in regular rotation, according to date, were quoted as to many historical land-marks in the subject.

Mr. Dresser is wrong in asserting that drying the specimen destroys the plant to such a formidable extent; it loses no more than is lost in the herbarium, while the Austrian metal pressure process brings to light what is not always seen in the simple herbarium. He is also wrong when he says that the metal pressure mode shatters specimens in an amusing manner. Specimens certainly have been shattered through unskilful manipulation, but this by no means constitutes a defect in the process; with regard to his assertion that this is a defect specially resulting in the case of tender plants, I can only reply that the most tender plants are the most applicable to the metal pressure process. Take the whole of the seaweeds, and also the most delicate fronded ferns, the perfectly undisturbed reproduction of which fine substances is truly marvellous.

Having on no occasion advanced any claim in Nature Printing further than pushing it into practical existence in this country, I have ventured upon the above remarks.

I remain, &c.,

HENRY BRADBURY.

STEAM SHIP ARITHMETIC.

Mr. Atherton has forwarded to the editor of the *Journal of the Society of Arts* the following letter addressed to the editor of the *Mechanics' Magazine*, and has requested it may be published as being connected with the subject matter of his papers which have been read before the Society:—

Sir,—With reference to the origin of the formula $\frac{V^3 \ D^{\frac{2}{3}}}{\text{Ind. h.p.}} = C$, and in reply to the remark of "A Constant Reader" in No. 1753 of the *Mechanics' Magazine*, namely, "I do not wish to under value Mr. Atherton's labours, and I think, on the other hand, he can hardly wish them to pass current as possessing a more original character than really belongs to them;" I am enabled to meet that remark by the follow-extract from "Steam-Ship Capability," page 9, wherein, referring to the formula $\frac{V^3 \ D^{\frac{3}{2}}}{\text{Ind. h.p.}} = C$, I express myself as follows, acknowledging its prior use:—

"The example set by the Admiralty in publishing and circulating a tabular record of the constructive elements and experimental trials of the screw ships of the Royal Navy, has not been met or responded to by any similar publication on the part of the proprietors of mercantile fleets. That this omission on the part of merchant steam-fleet proprietors, is injurious to their own interests, may be inferred from the great advantages which have resulted to mining interests generally, by reason of the periodical publication of the constructive elements and working operation of mine pumping engines; and the interests of steam-ship proprietors and of mine proprietors being analogous as regards the management of their motive power, it can scarcely be doubted that steam-ship efficiency would be greatly promoted by the engineering and ship-building rivalry that would unquestionably be consequent on the locomotive *duty* of all steam-ships being ascertained and numerically ranked, as is the working *duty* of the Cornish pumping engines. Notwithstanding, however, the interests that would be served by such comparisons of steam-ship performance, the published reports of mercantile steam-ship trials are generally so deficient of details as regards the ships' displacement at the time of trial and the working power of the engines corresponding to the speed attained, that such records rarely afford the complete data on which any conclusion as to the real merit of the vessel can be satisfactorily deduced, the test of relative merit being determined by the index number resulting from the formula $\frac{V^3 \; D^{\frac{2}{3}}}{\text{Ind. h.p.}}$, by which the screw ships of the Royal Navy have been compared."

My labour in this matter, which, so far as I know, is original, and was primarily brought before the public by my essay on "Steam-Ship Capability," consists in my having utilized this formula, so as to embrace the compound combinations of displacement, power, speed, and distance, in connection with the £ s. d. expenses incurred, thereby constituting a system of arithmetic adapted to the requirements of Mercantile Steam-Ship Service, by developing a process whereby merchants may calculate the prime-cost expenses of conveying cargo per ton weight as affected by different combinations of size of ship, length of passage, and speed required. I admit that this system of steam-ship arithmetic, as exemplified in Tables K. L. M., pages 78, 84, and 87, of "Steam Ship Capability," is, when once pointed out, a very simple affair, so much so, that I hope to see steam-ship arithmetic made a subject of rudimentary mercantile education, and an essential requirement on the part of every person who assumes the direction of steam-shipping affairs; and it was with this view that I followed up the subject by my papers read before the Society of Arts, London, 16th May, 1855, and 16th January, 1856, and by my paper on "Mercantile-Steam Transport Economy," read before the British Association, at their Cheltenham meeting in August last.

Your correspondent, "A Constant Reader," further objects to my having designated the co-efficient C, which results from the formula $\frac{V^3 \; D^{\frac{2}{3}}}{\text{Ind. H. P.}} = C$, as the index number of dynamic "duty," instead of using the term "performance," observing as follows:—

"The only use of the new term, that I can see, is to involve the origin of the formula in obscurity, and to give an appearance of novelty and originality to Mr. Atherton's labours to which they are not altogether entitled."

The foregoing explanation will, I hope, induce your correspondent to put a fresh construction on my motives. As to the nomenclature itself, by which I have endeavoured to develop and explain this system of "Steam Ship Arithmetic," I judged it to be appropriate to call the co-efficient C, on which the calculations are chiefly based, and which is not necessarily a constant number, when applied to vessels of different type, and not similarly circumstanced, by the term "index number," thereby implying its variability, and as the index number may be greater for a vessel of 500 tons displacement, such as H.M.S. *Reynard*, than it is for a vessel of 5,000 tons displacement, such as H.M.S. *Duke of Wellington*, whilst the "performance" of a vessel of 500 tons could not, in the general acceptation of the term "performance," be conceived to be greater than the performance of a vessel of 5,000 tons, the term "performance" might, therefore, mislead, and this was one reason for my having denominated the co-efficient resulting from the formula referred to as the index number of "dynamic duty," rather than call it the index number of "performance." Moreover, by thus adopting the term "duty," the index number of dynamic duty indicates the degree of merit that may attach to the locomotive operation of a steamship, analogously to the sense in which the index number of working "duty" indicates the degree of merit which may be due to the principle and constructive operation of a Cornish pumping-engine, the relative working efficiency of which engines have, for fifty years past, been denoted by the term "duty." Following, therefore, the established precedent of nomenclature used for analogous objects, I have adopted the term "dynamic duty," in preference to the term "performance," and, for the reasons above stated, I regard it as the least liable to mislead others in their studying and prosecuting the system of steam-ship arithmetic which I have endeavoured to inculcate. The only question with me is, whether it ought not to be called the "Index Number of Constructive Merit," that is the term which would challenge discrimination between sound practice and empty pretension in steam-ship construction, and do most public good in the quickest time.

I remain, Sir, your very obedient servant,
CHARLES ATHERTON.

Woolwich Dockyard, March 17, 1857.

Home Correspondence.

THE ECONOMY OF FOOD.

SIR,—As the *Journal* is open to a more extended discussion on Dr. Letheby's paper, I avail myself of it to remark upon a few points relative to matters to which the subject, and more especially his observations, tended:—"*Sir, you have taken such a quantity of food, and we will have so much work out of you.*" Now, as far as the domain of matter lies, unconnected with mind, chemical science has done and must do immense service, not to be underrated, and Dr. Letheby's paper, as well as the great ability displayed, must have been appreciated by all who heard it. But his application, according to the above expression, shows that he has not given the same study to the mind, and how little he recognises its powers, although manifesting so liberal a share of them himself. In Dr. Letheby's application of the subject to the criminal, can he say there is no food spent in consequence of that criminal's mental activity? So far as the mere wear of those material organs which are affected by the mind is concerned, they will receive strength simultaneously with the bodily organs by taking proper and nourishing food. Now it is an undisputed fact that the person working with mind and body at the same time, is unable to give the pound of flesh back which Dr. Letheby puts into him, for, without his own will, the mind, if active, consumes its share. It is well-known that a man doing physical and mental work together, can only sustain labour a fourth part of the time of another working without thought or mental application, even in a mere handicraft sphere of action; and in philosophical reflection, upon abstract or extended subjects, the body is incapable of performing the slightest labour. I would not have troubled you with these observations if the unnatural idea of demanding back in such exact ratio the food consumed, may not have a dangerous influence on the employed, in perverting the minds of the unscrupulous and less learned. Then, what you apply to the prisoner may in many cases be applied to those who are only more fortunate in not being criminals. This is just the thing that the manufacturers, in a former discussion at the Society of Arts, contended for; that men without intelligence or skill worked harder and better than the skilled. The chemists and they would seem to harmonise, first to ignore the mind, and then to calculate as by the rule of three, so much food, so much power; so much food, so much work. What a calculation! $F : P. = f : x$, hence $x = \frac{P.\ f.}{F.}$ But, alas! it is forgotten that the term f. traverses through a machine of such complexity and variation that the most subtle mathematics cannot reach it, though applied by the highest philosophers in chemistry. It has been recommended by the council to study political economy; is it not as necessary to study mental philosophy with physiology in connection with daily practical life? This administering of food for a fixed return, reminds one of the phrenologists who proposed to marry couples according to the development of their bumps. It is not true that the scientific men in their enthusiastic zeal to make science do its utmost, step too often beyond its proper limits, so valuable otherwise, and thus impede its legitimate progress.

There are a few points still which should not be omitted; some persons require much food to support life and health, which food gives in proportion no muscular strength, so much of what they consume wasting, without as it appears doing its part to nourish. Others again consume less food, but gain in bulk, without the system deriving strength; while others, under whatever circumstances, can eat but very sparingly. Thus, some we find *weak*, some *strong*, and others falling between, being as it were normal. Are the first cases not pathological, and the last the only true healthy one, and, therefore, the only one for experiment.

Another point is, when the mind under great irritation or the influence of the passions, gives an impulse to bodily action, and both get diseased, death perhaps ensuing. It appears to me if physical science accomplishes so much in our industrial progress, mental and moral science should not be excluded. Then evidently naked physiology, chemistry, and calculating political economy as thus enforced will degenerate mankind. Let us well consider in dealing with quantitative propositions (pure materialism or utilitarianism), that the mind of man (infinite in its nature) bears the application but to a certain point, and if we overstep it, all our efforts become negative or destructive. Matter does not govern mind, but mind will govern matter.—I am, &c.,

H. WAMPEN.

March 21, 1857.

THE ECONOMY OF FOOD.

SIR,—I was unable this evening, when the subject of scurvy was under discussion, to bring before the attention of the meeting the fact that there are cases where, though lemon juice and preserved vegetables have been found unequal to the prevention or remedying of the disease, another means has still been found effectual for the desired cure. I have been informed by an officer of the Royal Navy, who has twice had the disease when in the Arctic regions, that his second attack developed itself and progressed in spite of the most diligent use of the two above-mentioned anti-scorbutics. His recovery from the affliction he attributes to his adoption of the following course. He drank blood as it flowed fresh from the opened veins of wild animals just slaughtered. On this story, and on the subject generally, I would make the following remarks:—

1. We should not interpret this one negative instance as invalidating the enormous weight of positive evidence which exists in favour of the virtues of lemon and lime juice, but as showing this much, viz., that the form in which the anti-scorbutic principle exists in the anti-scorbutics ordinarily found effectual, may be, occasionally, that is, in certain states of certain constitutions, a form unfitted to further the assimilation and utilization of the said principle.

2. Granting the inference that blood really was the anti-scorbutic agent here, it would seem that in its possession of the anti-scorbutic principle, and in this point alone, does it resemble the usual remedies. So that two concretes, wholly diverse, save in one particular—their common possession of one principle, have the power of producing one effect. The chemist would at once decide that he has but to isolate this principle to produce all the effects which the complex and concrete substances had been previously employed to bring about. But the practitioner who acted upon the advice of the analyst would find himself for once led into error by that most useful of his fellow labourers, and feel in his disappointment the truth of a principle several times alluded to this evening, viz., that though certain insoluble principles may be regarded as the causes of certain effects, yet they do not appear to produce them unless they be wrapped up in one or other concrete form—"Non ex singulorum virtutibus virtus composita semper potest explicari." For no one, we are told, has yet been found hardy enough to employ simple potash, isolated and unassisted by fresh vegetables, as a remedy in scurvy; and citric acid, I am given to understand, has failed, as indeed the history here given also would lead us to anticipate it would, when it really was employed by itself, and to the exclusion of the usual anti-scorbutic remedies.

3. The chemical practitioner has been led to believe in the omnipotence of active principles, and the superfluousness of concrete media.

First. By the consideration of the singular success which has followed the isolation of the several alkaloids.

Secondly. By that tendency of the human mind; that "Idolon Specus," which, as Lord Bacon again and again repeats, leads men to suppose in nature the existence of a greater simplicity of arrangement than really is to be found there, or than anything save our own *à priori* conceptions would lead us to infer.

I am, &c.,

GEORGE ROLLESTON, M.B.

Ely-place, March 18, 1857.

THE ECONOMY OF FOOD.

SIR,—In perusing the very valuable paper of Dr. Letheby and the subsequent discussion, an impression is left of a very unsatisfactory kind, as though the meeting had made up its mind that we must go on for ever and for ever in one eternal round under the dominion of the "Law of Prey," animal feeding upon animal and men upon all, the final receptacle of matter, not in its wrong place, but in a very unpleasant form.

I do not believe in it. Our instincts are against it, *i.e.*, our rationalised instincts, and the vegetarian movement, ill-considered as it may be, is but an outward utterance of the growing perception, that in slaying animals for our food in a condition of civilisation, we are more cruel than the hunters of savage life; for we slaughter our tame creatures, fed by our hands, while they only kill the *feras naturæ*. More than that—our artificial breeding of animals produces in them many kinds of artificial disorders which recoil on their devourers This would seem to indicate that animal food is only a provision for man in the hunter state of existence, with a sparse population. Measley pork, consumptive beef, and rotted mutton, are not calculated to produce virile strength and health; and dunghill poultry does not yield the quantity of flesh found in the woodland pheasant, while Leicester mutton is a miserable substitute for forest venison, the healthiest of all animal food. To feed all London on venison would require the conversion of the rest of England into a chase.

Dr. Carpenter says, that chemical food, prepared artificially, does not supply the place of the organised food prepared in the alembics of nature. Yet surely this is merely a proof of the imperfect condition of our chemistry, which has made more progress in analysis than in synthesis. It has not yet solved the mystery of the aromas, those subtle principles that appear to act like fluxes in forming the union between the living body and the applied dead matter—the process of assimilation. When we consider that only fifteen years back we knew nothing of the chemical elements in our food and the purposes they subserved, we may imagine that another ten year may give us the knowledge in which we are still lacking. We cannot yet turn vegetarians on the imperfect materials given us by nature, but we may possibly improve the vegetables by feeding them better while growing, as a preliminary step to further chemical research. But assuredly we shall sooner or later get rid of the humiliating process of making our bodies the living tomb of dead animal matter. I am not a member of the "vegetarian body," or a believer in an exclusive vegetable diet, or even a vegetable diet eked out with incipient animals —eggs and milk—but I think improved vegetables will be one step towards the abatement of the "Law of Prey," a law pertaining to men and animals in the wild state—

the tygrine condition—but not belonging to a condition of high civilisation.

There is an old adage—"What is one man's meat is another man's poison," and some even like corrosive sublimate. It is not merely the plastic and respiratory elements that are wanted in food, but the assimilating fluxes suited to each peculiar condition. The philosophy of the fluxes or aromas once made plain, caseine and coagulated albumen—in other words—hard cheese, hard boiled eggs, may prove as digestible and assimilable as any other food, and the chemical bases of food and vegetables quite as available as the organised products of nature.

I am, &c.,
W. BRIDGES ADAMS.

1, Adam-street, Adelphi, March 24, 1857.

Proceedings of Institutions.

Boston.—At the annual meeting of the members of the Athenæum. held Feb. 20, 1857, Thomas Garfit, Esq., President, in the chair, the report for 1856 was read and adopted. The most important feature in the proceedings of the year 1856 is the acquisition of and removal to the new building—elegant and spacious premises, erected by the Corn Exchange Company. Few towns of the same population possess so commodious a building, devoted to such a purpose. The number of members has considerably augmented since the removal—upwards of 100 having being admitted into the Institution since the month of June. The present number is 505, being nearly double that at the formation of the Institution in 1851. The library has this year been increased to the extent of 850 volumes, the major part of which have been purchased, the remainder presented. Those purchased were selected with great care by a sub-committee, from the works of standard authors, on history, science, philosophy, poetry, &c. The works chosen are not of an amusing and ephemeral character, but of lasting interest and value. The issue of books and periodicals has been as follows:—London books 4,092 entries; own books 5,940 entries; periodicals 3,000 entries. The number of volumes had from the London library since last February is 474; the number now belonging to the Institution 3,000. The following lectures have been delivered; the attendance at each lecture numbering above 300;—"The Life and Poetry of Goldsmith," by the Rev. G. B. Blenkin, vicar; "Newspaper Literature," by Mr. Smyth; "The Life and Writings of J. Locke," by Dr. Cammack; "King Lear," by J. Conington, Esq., M.A.; "Habit," "Use is Second Nature," by the Rev. P. W. Clayden; several more lectures are promised; the thanks of the members being especially due to these gentlemen who so kindly and cordially respond to the solicitations of the committee. With reference to the classes, the committee express a hope that the examinations and certificates of merit, now organised and granted by the Society of Arts, may stimulate the young men of Boston, and induce them to devote a larger portion of their leisure to the acquisition of some special branch of knowledge; and they point, with much pleasure, to the honourable position occupied by a member of the Athenæum, Mr. Dawson, at the last year's examination. The financial position of the Institution, notwithstanding the very heavy and extraordinary expenses of the year, is satisfactory, a balance of £36 6s. 1½d. remaining to the credit of the Institution, after defraying all liabilities. The following gentlemen are the officers for the current year:—*President*—Thomas Garfit, Esq.; *Vice-Presidents*—J. Noble, Esq.; S. H. Jebb, Esq.; W. Garfit, Esq.; *Treasurer*—C. Wright, Esq.; *Honorary Secretary*—Mr. J. W. Bontoft; *Curators*—H. R. Gilson, Esq., and Mr. W. Veall; *Honorary Librarian*—Dr. Cammack; *Committee*—Rev. G. B. Blenkin, M.A., Rev. G. E. Pattenden, M.A., Rev. P. W. Clayden, Rev. T. W. Matthews, Rev. C. F. Newmarch, W. H. Adam, Esq., F. Cooke, Esq., F. T. White, Esq., F. L. Hopkins, Esq., W. E. Chapman, Esq., M. Staniland, Esq., T. Wise, Esq., T. Small, Esq., Surgeon, Mr. J. F. Smyth, Mr. J. G. Artindale, Mr. J. Noble, Jun., Mr. W. Greenwood, Mr. G. F. Bailey, Mr. C. Johnson, Mr. W. C. Bland, Mr. James Bontoft, Mr. A. Reynolds.

Leeds.—Two lectures were recently delivered in the Mechanics' Institution and Literary Society, by P. L. Simmonds, Esq., of London, "On the Commercial Products of the Animal Kingdom." The lecturer is a gentleman well known from his numerous and valuable contributions to the commercial literature of the day. His discourses on both occasions were well illustrated by an extensive and varied collection of the raw materials of the animal kingdom, and their various application in the arts in many elegant and costly articles of manufacture. The lecture of Monday derived much enhanced usefulness and interest from the rich collection of furs and skins of the choicest kind from Mr. Simmonds's own private museum of trade products, and from specimens contributed by Mr. Roberts, furrier to the Hudson's Bay Company. The numerous applications of ivory, bone, tortoise-shell, &c., were also fully exemplified by very costly and magnificent examples of turning, carving, and inlaying, of Chinese, French and English manufacture, from the collection of Mr. W. Lund, of Fleet-street. Every specific head of discourse was copiously illustrated to the eye by rare as well as common specimens. The articles were grouped and classified so as to assist the explanations given. The animal products used in pharmacy, food preparations—such as condensed eggs, solidified milk, essence of beef, the tripang and edible bird's nest of the Chinese, &c., were described. The products of fisheries, birds, and insects, were also illustrated and described. Seldom, indeed, has an audience enjoyed so facile an opportunity of surveying at a glance the whole group of industrial and staple products of the animal kingdom, furnished by creatures, denizens of the earth, the air, and the sea. It was justly remarked by the lecturer, at the outset, that there are few subjects in which the public have so deep an interest, and concerning which they have as yet so little knowledge, as the extent of the trade and commerce in animal products, and of the varied uses to which they are applied, the continually changing sources of supply, the quantities consumed—their prices, preparations, and uses. The statistics of all the principal articles treated of were brought down to the latest date with a view of furnishing a more adequate notion of their immense importance to a trading and civilised community. Mr. Simmonds alluded to the neglect of the whale fishery by this country in more recent years, and to the very lucrative trade which was now carried on by the Americans in that branch of industry in the North Pacific Ocean. These valuable lectures were very attentively listened to, and at the conclusion of each the specimens were examined with great interest by the auditory.

PARLIAMENTARY REPORTS.

SESSIONAL PRINTED PAPERS.

Par. No.

Delivered on the 12*th March*, 1857.

86. Surveyors, &c., of Stamps and Taxes—Return.
88. Assaults upon Women and Children—Return.
89. Dover Mails—Copies of Contracts.
94. History of Great Britain—Correspondence.
97. Committee of Selection—4th Report.
40. Bills—Portland Harbour.
43. ——— Racehorse Duty Act Amendment.
44. ——— Pauper Maintenance.
45. ——— Cinque Ports Act Amendment.
46. ——— Customs Duties (Amended).
38. Standing Orders for the Suspension of Private Bills.

Delivered on the 13*th March*, 1857.

66. Metropolitan Police—Accounts.
87. National Debt—Account.
31. Bill—Fiscal Affairs (Ireland).
Church Estates Commissioners—6th General Report.
Prisons in Scotland—18th Report of the General Board of Directors.

Delivered the 14*th March*, 1857.

19. Harbour, &c., Bills—XIX. Liverpool Town and Dock Dues (St. Helen's Canal and Railway Company)—Board of Trade Report.
103. Sir John M'Neill and Colonel Tulloch—Correspondence.
104. Standing Orders for the Suspension of Private Bills.
106. Mutiny Bill—Clauses 69 and 73.
61. Medical Museums—Return.

Delivered the 16*th March*, 1857.

25. Woods, Forests, and Land Revenues—Abstract Accounts.
95. Poor-rates (Metropolis)—Return.
47. Bill—Mr. Speaker's Retirement.
Ecclesiastical Commissioners for England—9th General Report.

Delivered the 17*th March*, 1857.

112. Canada—Extract of Royal Commission.
112. Hudson's Bay Company—Copy of a Despatch.
Births, Deaths, and Marriages in Scotland—2nd Annual Report of the Registrar-General.

Delivered on 18*th March*, 1857.

45. Local Acts (XIV. Waterford and Tramore Railway; XV. Herne Bay and Faversham Railway; XVI. Fawnhope and Holme Lacy Bridge)—Admiralty Reports.
100. Bankruptcy—Abstract of Returns.
108. Order of Victoria—Copy of the Royal Warrant.
109. Paper Mills—Return.
Customs—1st Report of the Commissioners.
Charity Commission—4th Report.

Delivered on the 19*th*, 20*th*, *and* 21*st March*, 1857.

102. Camp at Colchester—Copy of Correspondence.
115. East India and China Association of Liverpool—Correspondence.
136. Supply—Account of sums voted, &c.
105. Wheat, &c.—Returns.
107. Public Monies—Report from the Committee.
114. Bills of Exchange Act, &c.—Returns.
123. Library of the House of Commons—Report from the Committee.
131. Three per Cent. Consols—Account.
140. East India (Oude)—Return.
141. British and Foreign Vessels—Return.
45. Local Acts (18. Swansea Harbour Trust and Swansea Dock Company; 19. Sittingbourne and Sheerness Railway; 20. Tweed Fisheries; 21. Tweed River Fisheries; 22. Dartmouth and Torbay Railway)—Admiralty Reports.
323. (Session 1856.) Church Rates—Return (corrected pages).

Delivered on the 18*th March*, 1857.

Public General Acts, cap. 1, 2, 3, 4.

MEETINGS FOR THE ENSUING WEEK.

Mon. Actuaries, 7.
London Inst., 7. Rev. H. Christmas, "On the History and Antiquities of Heraldry; and on some other branches of British Archæology."
Tues. Royal Inst., 3. Prof. Huxley, "On the Principles of Natural History."
Chemical, 8. Anniversary.
Civil Engineers, 8. I. Renewed Discussion "On High-speed Navigation, &c." And if time permits—II. Mr. F. R. Conder, "On the Permanent Way of the Bordeaux and Bayonne Railway, across the Grandes Landes."
Wed. London Inst., 3. Mr. E. W. Brayley, "On Mineralogy and Crystallography."
Society of Arts, 8. Rev. W. Rogers, "On the Trade, Habits, and Education of the Street-Hawkers of London."
Pharmaceutical, 8½.
Royal Soc. Lit., 8½.
Thurs. Royal Inst., 3. Prof. Tyndall, "On Sound."
London Inst., 7. Rev. C. Boutell, "On the Monumental Memorials and Engraved Monumental Brasses of Great Britain."
Philological, 8.
Photographic, 8.
Antiquaries, 8.
Royal, 8½.
Fri. Archæological Inst., 4.
Royal, 8½. Rev. J. Barlow, "On some Modifications of Woody Fibre, and their applications."
Sat. London Inst., 3. Prof. Robert Bentley, "On Systematic Botany, with especial reference to the natural systems of arrangement."
Royal Inst., 3. Prof. Huxley, "On the Principles of Natural History."
Medical, 8.

PATENT LAW AMENDMENT ACT.

APPLICATIONS FOR PATENTS AND PROTECTION ALLOWED.

[*From Gazette, March* 20*th*, 1857.]

Dated 29*th December*, 1856.

3086. William Renwick Bowditch, Wakefield, York—Improvements in the manufacture of a compound to be used as a varnish for water colours, and as a carrier for water colours or paints.

Dated 19*th January*, 1857.

154. John Haswell, Vienna—Improvements in the construction of railway carriages, which improvements are also applicable to locomotive steam engines.

Dated 4*th February*, 1857.

322. Felix Moreau, Paris—Recovering the fatty matters from coom or dirty axle-grease and lubricating oils, thereby rendering them fit to be used again.

Dated 11*th February*, 1857.

399. Achille Constantin Dandraut, 19, Rue Neuve des Petits Champs, Paris (now at 20, Earl-street, Blackfriars-road)—Preserving organised animal and vegetable matters, especially alimentary substances.

Dated 12*th February*, 1857.

417. William Edward Newton, 66, Chancery-lane—Improved machinery for cutting metals or other hard substances. (A communication.)

Dated 13*th February*, 1857.

422. Charles Crossley, Dan Leeming, and John Crossley, Halifax—Improvements in apparatus for heating and in taps to be employed in combination therewith, which taps are also applicable for general purposes.
432. George Hardstaff, Skegby Colliery, near Mansfield—Improvements in apparatus for actuating and applying the breaks of carriages used on railways, and coupling such carriages.

Dated 19*th February*, 1857.

482. Lot Wilks, 18, Bedford-row—An apparatus for signalling between the guards and engine drivers on railway trains, which is also applicable to other similar purposes.

Dated 20*th February*, 1857.

494. Henry Thomas Hellyer, Ryde—Improvements in the construction of bridges and arched structures.
498. John Rowland Crook, Birmingham—An improved material for, and an improvement in, the manufacture of hat tips, which material is also applicable to the mannfacture of hat and other boxes or cases.

Dated 23*rd February*, 1857.

528. John Kirkham, Tonbridge-place, New-road—Improvements in the construction of furnaces, ovens, or kilns, for drying, baking, or burning pottery or earthenware, bricks, tiles, or other similar articles, and in the means of collecting and condensing or carrying off the smoke, gases, or vapours evolved from such or other furnaces or fire-places, or that escape or arise from the retorts and other parts of the apparatus used in the manufacture of gas.

Dated 25*th February*, 1857.

556. John Henry Johnson, 47, Lincoln's-inn-fields, and 166, Buchanan-street, Glasgow—Improvements in carding machines. (A communication.)
558. James Spence, Park-terrace, Brixton-road, Surrey—An improvement in the manufacture of artificial coral.

Dated 26*th February*, 1857.

560. John Henry Glew, 18, Charlotte-street, St. Pancras—An improved method of fastening ladies' and gentlemen's boots and shoes.
562. William Edward Wiley, Birmingham—Improvements in ever-pointed pencil-cases.
564. Joseph Hoy, sen., Islington—Improvements in apparatus for distributing sand on railway rails.
566. Charles Bruton, sen., Charles Bruton, jun., Francis James Bruton, and Samuel Rogers Bruton, Manchester—An improved azure blue for domestic purposes.
568. William Mills, 2, Lower Craven-place, Kentish-town—An improvement in the action of upright pianofortes.
570. Victor Cassaignes, 10, Queen-street, Golden-square—Improvements in the manufacture of metallic pens and pen-holders.
572. Nathaniel Jones Amies, Manchester—Certain improvements in machinery or apparatus for polishing and finishing yarns or threads.

Dated 27*th February*, 1857.

574. David Davies, Wigmore-street, Cavendish-square—An improvement in steps for carriages.
576. William Wilkinson, Nottingham—Improvements in lighting, and in lamps.
580. James Richard Field, 114 and 115, Fore-street, Cripplegate, Julius Goodman, and Louis Goodman, 41, Great Prescott-street, Goodman's-fields—Certain improvements in trousers.
582. Alfred Vincent Newton, 66, Chancery-lane—An improvement in springs for railroad carriages and other uses. (A communication.)

Dated 27*th February*, 1857.

584. Frederick Stubbin, Bawtry, Yorkshire—Improvements in propelling vessels.
586. Anguish Honour Augustus Durant, Conservative Club, St. James's-street—Improvements in apparatus for ascertaining and indicating the number of, and distance travelled by, passengers in public carriages, and the fares paid.
588. Charles Weightman Harrison, Woolwich—Improvements in obtaining light by electricity.
590. George Wilson, Glasgow—Improvements in weaving.
592. Henry Whatley Tyler, 12, Norfolk-crescent, Hyde-park—Improvements in the permanent way of railways.
596. Henry Duncan Preston Cunningham, Bury—An improvement in sails, and in the reefing and furling of sails, and setting and taking in of sails.

Dated 2*nd March*, 1857.

598. James Murphy, Newport, Monmouth—Improvements in securing screw nuts on their bolts, and bolts in plates.

600. Charles James Parry and William Briddon, Manchester—A certain improvement in the manufacture of shirt collars.
602. Frederick Decastro Jones, 29, Tavistock street, Covent-garden—An improvement in the construction of the bits of horses. (A communication.)
604. Edwin Francis Jones, Redcar, Yorkshire—Improvements in the manufacture of pig and bar iron.
606. Thomas Rose, jun., Botany Bay Farm, Hilgay Fen, Norfolk—Improvements in apparatus for cutting or disintegrating vegetable substances.
608. Charles Pauvert, Chatellerault, France—Certain improvements in manufacturing iron.
610. Charles Pauvert, Chatellerault—Certain improvements in manufacturing steel and cast steel.
612. Richard Archibald Brooman, 166, Fleet-steeet—A method of constructing and heating buildings and apparatus for the winding of silk from the cocoon. (A communication.)
614. William Brown, Gresham-street—An improved mode of preparing tapes for the market.
616. Thomas Gray, Rose-lane, Stepney—Improvements in separating vegetable fibres from mixed fabrics.

Dated 3rd March, 1857.

620. William Leuchars, 38, Piccadilly—Improvements in locks for travelling bags, portfolios, despatch boxes, and such like depositaries.
622. Edward Lindner, New York—Improvements in cartridges and bullets, together with an apparatus for producing the same.
624. William Edward Newton, 66, Chancery-lane—Improved means for preventing the forgery or imitation of bank-notes, bills, certificates, cheques, bonds, deeds, and other like articles. (A communication.)
626. William Edward Newton, 66, Chancery-lane—A preparation of materials for coating roofs or other portions of buildings to render them impervious to wet. (A communication.)
628. William Adam and John Stewart Templeton, Glasgow—Improvements in weaving looped and pile fabrics.

Dated 4th March, 1857.

631. Gerard Ralston, 21, Tokenhouse-yard—Improvements in fire-arms, and in balls or projectiles. (A communication.)
633. William Hartley and Thomas Hardman Farrar, Bolton—Improvements in looms.
635. Henry Lawrence De Zeng, Geneva, New York—Improvements in marine and fog signals, for reefs and other locations.
627. John William Heinke, Great Portland-street—An improved construction of diving bell.

Dated 5th March, 1857.

639. George Walter Dyson, Tinsley, near Sheffield—Tilting iron and steel or any other malleable substance by perpendicular motion.
641. William Muir, Glasgow—Improvements in generating steam for marine purposes.
643. Samuel Sutcliffe and James Stocks, Manningham, Bradford, Yorkshire—Improvements in means or apparatus in connection with steam-boiler and other furnaces to facilitate the consumption of smoke therein.
645. Hugh Greaves, New Palace-yard—Improvements in the mode of coupling or connecting pipes, columns, and conduits in the machinery for manufacturing the hoops to be used in connecting such pipes and columns, and in the shape of such pipes, columns, and couduits, whereby they become adapted for the support and conveyance of vehicles.
649. George Bower, St. Neots—Improvements in apparatus for manufacturing gas.
651. William Travis, Crompton, Prestwich-cum-Oldham, Lancashire—Improvements in furnaces.
653. James Kinder Cheetham and Thomas Southworth, Rochdale—Improvements in the use or application of certain substances for sizeing or finishing yarn or thread, also applicable for sizeing or stiffening woven and other fabrics.
655. Richard Atkinson Coward, Laurence Pountney-lane—Improvements in screw or submerged propellers.

Dated 6th March, 1857.

657. Francis Alton Calvert, Manchester–Improvements in machinery for ginning cotton and for cleaning and carding cotton and other fibrous materials.
659. Luke Barton, Ison Green, near Nottingham, and Edwin Stanley Brookes, Nottingham—Improvements in the manufacture of knitted fabrics.
661. William Petrie, Woolwich—Improved means of and apparatuses for creating or increasing draughts and currents.

Dated 7th March, 1857.

663. Rowland Mason Ordish, St. Mark's-crescent, Regent's-park—Improvements in suspension bridges.
665. Josiah Parkes, 11, Great College-street, Westminster—An improved apparatus for locomotive purposes.
667. Charles Lungley, Deptford Green Dockyard—An improved mode of constructing dry docks and basins for the stowage of ships.
669. Georges Antoine Tabourin, Lyons, France—An improved rotative engine.

Dated 9th March, 1857.

675. Clement Sharp, Birmingham—A new or improved manufacture of ships' thimbles and other metallic fittings used for rigging and sails and rope gearing in general.
679. George Davies, 1, Searle-street, Lincoln's-inn, and 28, St. Enoch-square, Glasgow—An improved self-inking stamp for printing cards, labels, and other articles. (A communication.)
681. Samuel Faulkner, Manchester—Certain improvements in machinery or apparatus for carding cotton and other fibrous substances.
683. Henry Richard Smith, Wellingborough—Certain improvements in manufacturing and purifying gas made from coal or other bituminous substances for illumination.
685. Charles Colton Dennett, Nottingham—A new construction of floors and ceilings of buildings.
687. William Edward Newton, 66, Chancery-lane—Improved machinery for cutting screw threads. (A communication.)
689. Alfred Vincent Newton, 66, Chancery-lane—An improved construction of rudder. (A communication).
691. Andrew Knox, Mile-end, and Thomas Robson, Aldersgate-street—An improved gas regulator.
693. William Charles Theodore Schaeffer, Stanningly, near Leeds—Improvements in treating the waste waters of woollen and other mills.
695. James Edward Duyck, West Farleigh, Kent—An improvement in treating cotton seed, in order to extract colour from the oil obtained therefrom.

Dated 10th March, 1857.

697. Johannes Neuenschwander, Albion-wharf, Kensington-basin, Kensington—Improvements in the process of preserving milk.
699. Charles Reynaud, Lyons, and 2, Catherine-street, Strand—Improvements in the application of india-rubber springs to mattresses, sofas, chairs, and other cushions or articles of furniture. (Partly a communication.)
701. Charles Baylis, Poultry—An improved method of constructing and arranging roads and ways, particularly applicable to populous cities and crowded thoroughfares.

INVENTION WITH COMPLETE SPECIFICATION FILED.

735. William Pidding, New Kent-road—Improvements in machinery or apparatus for the manufacture of piled fabrics, whether plain or figured.—16th March, 1857.

WEEKLY LIST OF PATENTS SEALED.

March 20th.

2227. Francis Wrigley.
2233. Andrew Barrie.
2237. Peter William Barlow.
2295. James Begg.
2305. Edwin Hardon and Joseph Henry.
2327. Alexis Picard.
2352. Francis Whitehead.
2371. Lewis Jacob Jordan.
2397. Giovanni Battista Piatti.
2403. Richard Archibald Brooman.
2413. George Hazeldine.
2481. Frederick Walton.
2515. Benjamin Ferrey.
2605. William Seed and William Ryder.
2701. Henry Hawkes Fox.
2727. William Brindley.
2863. Phillipp Kurten.
72. John James Russell and Joseph Bennett Howell.
111. François Auguste Verdeil, and Edmund Michel.
247. George Cranstoun Trotter Cranstoun, Geo. Young, and John Lovell.

March 24th.

2254. Claude Langlois.
2259. George Gower Woodward.
2263. George Neall.
2269. Joseph Edwards.
2275. James Noble Ward.
2277. Mathew Hickson.
2279. Robert Morrison.
2292. George Flint, Thomas Wood and Edward Wood.
2320. David Ogilvy Boyd.
2334. Herbert Mackworth.
2384. William Caswell Watson.
2385. Anton Bruno Seithen.
2429. William Jeffrey.
2444. Isidore Delcambre.
2494. Leonard Alexander Desachy.
2520. James Fenton.
2552. Henry Holcroft.
2923. Hector Mottet.
2939. Richard Emery.
2978. William Frederick Thomas.
124. Charles Wye Williams.
153. Thomas Sagar.
211. Pier Alberto Balestrini.
257. George Fergusson Wilson.
295. Astley Paston Price.

PATENTS ON WHICH THE THIRD YEAR'S STAMP DUTY HAS BEEN PAID.

March 16th.

640. Alexander Henry.

March 17th.

646. John Hick.
649. Perceval Moses Parsons.
667. James Hansor.

March 18th.

695. John Jeys.
791. Charles De Bergue.

March 19th.

658. Claude Adrien Bernard Chenot.
668. John Polson.
702. Thomas John Smith and Joseph Smith.

March 20th.

689. Stephen Holman.

WEEKLY LIST OF DESIGNS FOR ARTICLES OF UTILITY REGISTERED.

No. in the Register.	Date of Registration.	Title.	Proprietors' Name.	Address.
3955	March 1.	Crystal Lamp	John Jefferies Stone	London.
3956	,, 14.	Improved Smut and Chaffing Machine	John Coulson and Co.	Grantham.
3957	,, 20.	Shirt Collar	Walter Leigh	4, Glengall-grove, Old Kent-road.
3958	,, 21.	The People's Portable Stereoscope	Moran and Quin	65A, Poland-street, Oxford-street.
3959	,, 23.	Ventilated Waterproof Cap Life Buoy, &c.	George Bayley	37, Upper Thames-street.

Journal of the Society of Arts.

FRIDAY, APRIL 3, 1857.

NOTICE TO CANDIDATES.

Persons who intend to offer themselves as Candidates at the Society's Examinations in June next, in London and at Huddersfield, are desired to take notice that no one will be admitted to the Examinations who shall not have sent in his "Return paper" to the Secretary of the Society of Arts, before Monday, the 20th of April next.

Forms of the "Return paper" may be had on application to the Secretary of the Society of Arts.

EXHIBITION OF INVENTIONS.

The Society's Ninth Annual Exhibition of Inventions was opened on Monday, the 23rd ult. The Exhibition will be open every day till the 23rd of May, from 10 a.m. to 4 p.m., and is free to the members and their friends. Members, by tickets or by written order bearing their signature, may admit any number of friends.

NOTICE TO INSTITUTIONS.

James Patrick Muirhead, Esq., F.R.S.E., has presented to the Society of Arts, for distribution amongst the Institutions in Union, 27 copies of "Correspondence of the late James Watt, on his Discovery of the Theory of the Composition of Water," and 186 copies of "The Historical Eloge of James Watt," by M. Arago.

Those Institutions which desire to have copies of these works, are requested to make early application to the Secretary of the Society of Arts.

SPEECHES AND ADDRESSES OF H.R.H. PRINCE ALBERT, PRESIDENT OF THE SOCIETY OF ARTS.

At the annual dinner of the Society for the Encouragement of Arts, Manufactures, and Commerce, in the Crystal Palace, on the 24th of June, 1856, Lord Ashburton, Vice President of the Society, in his address from the chair, observed:—"To induce the tired mechanic to study during his hours of rest, he must have some inducement beyond that of acquiring knowledge for its own sake; he must be paid for it in wages or in consideration, and that inducement he cannot hope for from ignorant employers. Prince Albert has felt this difficulty; a difficulty not within the compass of this Society to remove: and he has brought up succour to us from other quarters. He assigned to science and high art its due place in the hierarchy of society; he has encouraged our scientific and artistic institutions, but above all he has adopted that course which among Englishmen is of most avail,—he has attended our public meetings, and has in his own person appealed to us to reform ourselves. Those appeals at the time produced their effect, and would continue to work upon the public mind, if this Society would in its own interest, and in the interest of the cause it espouses, print and circulate Prince Albert's addresses for our use."

At a meeting of the Council of the Society of Arts held on the 23rd of July, 1856, the foregoing suggestion was taken into consideration, when the following minute was passed:—

"That Lord Ashburton's suggestion, to collect and publish the addresses, speeches, and letters of H.R.H. the President of the Society, having been considered, it was resolved:—That a collection be published, not at the risk of the Society, but by subscription among the members, the Institutions in Union, and the public at large, as being the best means of showing the public sense of the efforts made by his Royal Highness to promote social progress and the Encouragement of Arts, Manufactures, and Commerce, the chartered objects of the Society

"That two editions of the collection be published under the sanction of the Society, the one a cheap edition for wide distribution, and the other a library edition.

"That members and others wishing to become subscribers be requested to transmit to the Secretary a statement of the number of copies they subscribe for, with the amonnt of subscriptions."

It is proposed to publish the Library Edition at half-a-guinea, and the cheap edition at threepence each, or one pound per hundred.

Subscriptions to promote the above object will be received by the Secretary.

SEVENTEENTH ORDINARY MEETING.

Wednesday, April 1, 1857.

The Seventeenth Ordinary Meeting of the One Hundred and Third Session was held on Wednesday, the 1st inst., the Right Honourable the Earl of Shaftesbury in the chair.

The following Candidates were balloted for, and duly elected members of the Society:—

Burbridge, George Frederick
Leather, J. T.
Magnay, Frederick Arthur
Merrett, William Gwillim
Morton, John Lockhart
Watney, John
Worms, Anthony
Worms, George
Worms, Henry
Young, James

As a Corresponding Member.

Cramp, Rev. John M., D.D.

The Paper read was:—

ON THE TRADE, HABITS, AND EDUCATION OF THE STEET HAWKERS OF LONDON.

By the Rev. W. Rogers.

I have considerable diffidence in coming forward this evening to read a paper before this Society, especially at this time, and under such a presidency. This Society calls itself the Society of Arts, but I am not famous in any of the branches, either of art or science, nor does the subject which has been entrusted to me admit that I should offer to you any new development in art or science, unless it be a lecture on the art of garotting and a discussion on the practical science of pocket-picking; doubtless, both of these are capable of great development, and new theories are being constantly propounded, which active agents are always at hand to carry out into practice, but as I have never sat at the feet of Professor Fagin, nor received instruction from the Artful Dodger, and as it has rather been my study to introduce, through the means of education, a moral anti-garotte collar, and a new pocket guard by endeavouring to restrain the itching finger, I am afraid I have nothing new in those arts and sciences to which the class I am invited to describe are addicted, to bring before your Society. The time, too, perhaps, is not very opportune, for the subject has been already, I am afraid, thoroughly exhausted by the gentleman who wrote upon it in the *Morning Chronicle*, and who described the habits and trade of these people with so much clearness and accuracy, having previously made himself intimately acquainted with their life and manners. To follow in the wake of such a writer is no easy task; however, as my knowledge of these gentry is not general, but confined to a particular district, and as I do not pretend to branch out beyond my own sphere, I may, perhaps, be able to touch upon some points of character peculiar to the inhabitants of my locality which may possibly have escaped his observation. But my diffidence is considerably increased when I consider who the nobleman is who has kindly consented to preside on this occasion, one who has made it his study to inquire into the wants of the lowest classes of the people, and who has devoted himself with so much zeal and success to institute and carry out well-devised schemes for their alleviation; for I feel that I can describe nothing new to him in delineating the character of these classes, and can originate no plan for their improvement which has not already received his serious consideration.

However, as you have paid me the compliment of asking me to read the paper, I will do my best, and crave your forbearance if I do not make the subject as interesting as I know it is capable of being made.

But the question may be asked, Why have you been selected to read this paper? What have you to do with these people? Now, I do not wish to take to myself any credit, and I know great credit is due to those who, actuated by the highest principles of humanity and love, plunge into the lowest depths of society, prepared to drag forth from the dens of infamy and degradation the outcast and abandoned. Circumstances have led me to form an acquaintance with these people, and it has fallen to my lot, in the course of my professional duties, to get some insight into the trade, habits, and education of street hawkers.

I served as curate for two years in a metropolitan parish, where, owing to the facility of obtaining greens, and other stuff, from the market gardens, many of the people were employed in this business. To such an extent was this the recognised trade of the natives, that whenever any man wanted to raise a sum of money from the charitable, of which there were many in the parish, it was the custom to go round with a petition, stating that, owing to the death of his donkey, he was quite thrown out of employ, and consequently starving. Had all these petitions been true, instead of a dead donkey being a rarity and a proverb, the streets would have been as thickly strewn with carcasses of this useful animal as the gardens were planted with cabbages.

Since I came to London it has been my duty to minister in a district, the population of which I have described in a letter, addressed to Lord John Russell, a year or two ago, as peculiar—peculiar, not only as numbering in their ranks a much larger per centage of bad and profligate people than is to be found in other districts; the very nature of the courts and houses breeds this kind of gentry, rendering the *locale* a complete refuge for the destitute, so that, whenever a gang of thieves, fortune-tellers, or others of this class, are routed out from one neighbourhood, they are sure to resort thither, well-knowing that, if the police, stirred up by the inhabitants, will not allow them to remain in other places, there, at all events, they will be undisturbed, and may carry on their nefarious practices in peace. But they are peculiar in another way; they are not like the inhabitants of Bethnal-green, or St. George's in the East, who are employed in some particular business, either silk-weaving or working in the docks, and who, though poor, are at the same time industrious, but they are all ragamuffins. This is the peculiarity of this district. It is a district of ragamuffins. I do not mean to say that there are not some industrious poor and respectable persons living there; I know that there are, and that they deplore equally with myself the state of things around them, but if you were required to describe this district, you would not describe it as agricultural, or manufacturing, or mining, but you would describe it as a costermongering district; it is, in fact, costermongria. Having been called then from the market gardens to such a field as this—having served as curate for two years among the purveyors of greens, and as what is called perpetual curate among their brethren in the dried fish and winkle line for twelve years, I think that, without taking great credit to myself, I may claim some acquaintance with the habits of these people. The paper describes them as street hawkers, but as the word is to be found in Johnson's Dictionary, I do not see why we should mince the matter, and proceed at once to call them by their right name—costermongers.

Johnson defines a costermonger as a dealer in apples—a fruiterer—and he quotes a passage from Burton on Melancholy. "Many country vicars are driven to shifts, and if our greedy patrons hold us to such conditions, they will make us turn costard-mongers, graziers, or sell ale." Had Burton lived to see the days of extramural interments, and the solemnization of marriages before the Registrar, he would have included the town vicars among those who are "driven to shifts," though we hope that the patrons of the present day are not quite so greedy as to compel us to change our cassocks into blue aprons, or to walk about for six days in the week with baskets of apples on our heads.

A costermonger then, is, properly speaking, one who sells apples, but the name is not confined exclusively to the dealers in this kind of merchandise alone, but it is applied to all those who, as it is technically termed, get their living in the streets—who hawk about fish, vegetables, &c. The most aristocratic possess a cart and donkey, the next class a truck or barrow, the lowest have their little all contained in a basket. Their earnings are necessarily most precarious. Vendors of watercresses, onions, oranges, apples, and fried fish, generally carry their stock in a basket, and their profits vary from 2d. to 2s. or 3s. per day. Vendors of garden stuff, flowers, fruit, and fresh fish, these go about with a barrow, and their earnings vary from 10s. downwards, and sometimes they are out of pocket owing to their goods being spoilt. Makers and hawkers of children's toys—their profits on their best days are 7s., and sometimes they do not clear 2d. Some of them have to borrow money to buy their stock, and for this they have to pay interest at the rate of 10 per cent. per day. Some of them are not so fortunate as to possess a barrow, and they have to hire one, which they can do by paying from 3d. or 4d. per job, or 2s. per week. From this it will be seen that their earnings are very precarious, and for the most part they are very poor. At the same time I believe that a man can do very well at this business if he chooses, and if he is prudent he may get a tolerably comfortable livelihood. I was much struck one day visiting in a house in my parish, on ascending the stairs, to hear most unwonted sounds proceeding from a room on the first floor. It was the voice of a man singing cheerfully, as if he was happy. It was no vulgar boisterous mirth, but the cheering notes which proclaim a light heart. So struck was I with these sounds in this dreary quarter, that I made some excuse to go in and see what it was all about. When I entered I found a cheerful looking little man, surrounded by baskets of very excellent fruit, seemingly engaged in arranging them, and getting them into order for going out to sell them in the streets. After the usual salutation, I said, "You seem happy and comfortable." "Yes, I am, sir," he said. "God has been very good to me." "What has happened,". I said. "Well, sir," he said, "it has pleased God to take away my old missis, and I have been a happy man ever since. You see all this fruit—this is my stock-in-trade, and I have saved £20, and I intend this summer to buy a cart and pony, and to do the thing in style." "But what," I said, "has this to do with your wife's death." "Everything, sir, for she drank, and was my ruin. A year and a-half ago, sir, I had not a stick of furniture, not even a bed to lie down upon, and now you see what I am. Lord bless you, sir, if I go on as I am, I shall soon be a gentleman." I mention this as illustrating what I said, that a costermonger may do very well indeed in his business if he is only prudent and temperate.

But for the most part their habits are the very opposite of this, and are so from the nature of their business, which consists in hanging about public-houses and markets, wandering over the town, and walking for miles through the streets. Men, women, and children are all engaged in the business, and acquire such wild and Arabian habits from their occupation, that it is almost impossible to get any hold upon them at all. They are, for the most part, recklessly improvident, spending often all their earnings at one sitting in the gin palace, then selling off everything and lying on the floor. Then they will borrow a few shillings at extravagant interest, and begin again. Their homes, too, are most wretched, generally in low courts and alleys, because here there is standing room for their barrows, and consisting of one room in which they live, work, sleep, and manufacture their goods; that is, steam their oranges, boil their winks, fry their fish, smoke their sprats, polish their apples, and make their toys. Men, women, and children, all huddled together in one room; the state of morality can be conceived but not described.

Such being the trade and habits of a costermonger, the question arises how does a man become a costermonger? It surely is not a profession to be coveted or to be taken up from choice. Well, a man becomes a costermonger from necessity and from descent. Some of them are artisans and mechanics, whose trades from some cause or other have failed, or who have been out of employ for some time, and who have taken to this as a means of living. And this opens out the great social question which is forcing itself upon the minds of thoughtful people at this time, as to the condition of the regular industrial employments, and whether or not they are so overstocked with workers that artizans and labourers are forced to take to the street in order to obtain a livelihood. If they are, it appears to me to be a most unhealthy state of things, and one which cannot be contemplated without great anxiety, for it is evident that this kind of business must necessarily be very demoralising, engendering wild and unsettled habits, and bringing those employed in it into constant collision with the police—a business which, if it increases to any very great extent, must become an intolerable nuisance to the town. I know it is argued that the trades followed by hawkers are usually such as do not seriously interfere with the regular trader, and that it should be the duty of a wise and Christian government rather to encourage the industry of the hawker, than to discourage it by hounding on police officials, to drive the hawkers about, and render the attainment of an honest livelihood as difficult as possible. But, I put it to any one, whether the town would be bearable if this trade were not kept in check by the police? What would be the condition of the streets if these fellows were permitted to obstruct the thoroughfares with their barrows, and to thrust oranges and steel pens into your face just as they pleased, without any restraint? We all know how soon these things get abused. There is the Shoeblack Brigade, a most useful institution, and one which ought to be encouraged, but what has been the consequence of the introduction of the Shoeblack Brigade? Why, that in many parts of London you can hardly pass for fellows soliciting to black your boots, and, though you protest, and point to your boot shining with all the combined polish of Day and Warren, nothing will abash them. And so it would be with the sale of oranges and other articles, if the vendors did not feel that the eye of the police was upon them. I believe the rule is that a certain number of them are allowed to have stalls, if they do not inconvenience the inhabitants before whose doors they sit, and that others are not interfered with if they keep moving, and do not obstruct the thoroughfare. Whether or not it would be advisable to grant licenses to the more respectable, is a question for Sir Richard Mayne to decide; but I am quite sure that no one, whether he be political economist or philanthropist, would endure the state of the town if these people felt that they were not under the surveillance of the police. This is the first class from which costermongria recruits its ranks—artizans and labourers out of employ. Others are of that class who, fancying that the streets of London are paved with gold, have come up from the country fondly imagining that in a short time they would make their fortunes, and either become Lord Mayor or member for the county, and who, when they found that there was a good deal of dirt mingled with the gold, have been thrown friendless upon the town, but having some knowledge from their country education that there is a difference between a carrot and a cabbage, turn their experience to account, and give their neighbours the benefit of it by hawking fruit and vegetables at their doors. Of this class was my little cheerful friend, who bore his widowhood with so much composure, and who really had been a very respectable market gardener in Bedfordshire, and who, from circumstances, had become what he was, and turned his experience to so good an account. But others, and those in large numbers, are born to the business—inherit it as it were from their parents, and are introduced to it from their very childhood. It is extraordinary how this kind of business is carried on by families. In my letter to Lord John Russell I mention one old lady of my acquaintance, a daughter of Cyclops, who herself had a stall, or, as it is called, *sat* in Whitecross-street. She has had fourteen children, all of whom were in early life brought up to the streets. Some of them died; the rest have large families all engaged in the trade; one daughter had fourteen children; one grand-daughter has already had nine children, though only thirty-one years of age. The three generations have all got their living in the streets. The old block herself has lately been removed to the workhouse, but it will be seen by the above statements that there are plenty of chips to supply her place. Of another family the grandfather was hung at Horsemonger-lane Gaol, the son was a professed body-snatcher, lived with his step-sister, and had five children, all with families, and all costermongers. Another man had seven children; all have got families, without being married, and all costermongers.

These are a few specimens illustrating the habits of street hawkers.

Let us now pass on to their education. This, of course, is at the lowest standard. Many of those with whom I have come in contact could not read, and some even did not know who Jesus Christ is, nor could repeat the Lord's Prayer. They are for the most part grossly ignorant, and as for a church, of course that is the last kind of place they feel disposed to enter. Their ignorance arises from the nature of their business, and from the neglect to which they have been left. It does not require much book-learning to qualify for the office of calling out "fish" in the streets; and then Sunday, the only day on which it might be hoped that they would get some instruction, is their chief day of traffic, and it cannot be denied that they have been sadly neglected, and moral and religious truths have not been brought home to them as they should have been in a christian country. But now comes the question, is this ignorance to continue? Is one generation after another of this very large and increasing class to grow up acquiring worse habits than their parents, recruiting the ranks of crime, and becoming a pest to the town? Most assuredly not, for it is not only that there are so many hundred souls left in darkness in the midst of a Christian metropolis; this is a grave consideration — but these are the people who are the grist of our treadmills, and supply our workhouses with inmates; and, what is even worse, these are the people who, in times of disturbance, would be the first to band themselves against the authorities.

I believe that while such a mass of ignorance and depravity remains at our very doors, we are standing upon a mine which it requires only the igniting of a match to explode. Doubtless there must be costermongers, and doubtless a very useful class of people they are in their way, but I see no reason why they should necessarily be heathen, and addicted to all kinds of heathen profligacy. I do not see why it is necessary, in order to circulate greens and fish through the arteries of London, that a whole class should exist who are for the most part in various degrees of proficiency—thieves and smashers, and characters of the worst description—and I do think that some steps should be taken in their behalf, that some measures should be adopted in order to tame them. That at all events opportunities should be afforded them of becoming to a certain extent civilized, to feel that they are accountable beings, with souls to be saved or to be damned.

And I have hopes even for my costermongers. I speak of my costermongers, because I do not know what others are about; but I can speak for my own, and I believe that there is a desire growing up among them for improvement—an earnest of better things to come. In the first place, there seems to be a greater anxiety about the education of their children. I will not insist upon the case of the father whose boy had been detected in stealing, and who brought him to the schoolmaster to be punished, but who afterwards told me that he had given him a better lesson than the schoolmaster, for he had taken him to see Marley hung that morning—but there really does seem a desire on the part of these people that their children should attend the schools. As probably the greater part of my audience are aware I have lately opened large schools, especially for this class, but for the last year and more we have gathered some of the children in a vacant room in the old schools, and the attendance has been most satisfactory; out of 80 boys attending this school, 50 were in a position to claim the government capitation money, on the ground of having attended 176 days and upwards, and I feel little doubt that when we begin operations on a large scale in the new schools, they will be equally well attended. And so with the adults; for the last two years we have opened a room three times a week for religious instruction, and these meetings are attended by at least 150 women and 80 men, and I have no doubt that when these meetings are transferred, as we intend to transfer them to the new schools, the attendance will be very much larger; indeed, our attendance has for some time far outgrown our original room. In order to add a little attraction to these meetings, and to foster a social and kindly feeling among the people, we have an occasional tea-party for the women, and supper party for the men. Upon the late occasion of the opening of the new schools by his Royal Highness Prince Albert, upwards of 150 women, regular attendants, sat down to tea and buns, and 90 men partook of bread and cheese with a *soupçon* of a pretty strong onion and a screw of tobacco at parting, to comfort their hearts before they went to bed, while the doors of the school were thrown open to the other denizens of our alley who were invited to witness the proceedings upon the French principle—*pour encourager les autres.*

I have thus, at the risk of wearying my audience, spoken of what we are doing in my own district, because I have thought that what has been done in one place may be accomplished in another, and in hopes that it may be some guide to others in the same kind of forlorn districts.

Suffer me, in conclusion, to dwell for one moment upon what I think ought and might be done to improve the educational condition of this class of people.

In the first place, we must have schools specially for them. The habits of the children are peculiar from the nature of their occupation, from the houses they live in, and from being constantly required to assist their parents, they are necessarily dirty and unfit to mingle with other children. Then they have to go early in the morning to the market, and are not in a condition to come to school at nine o'clock. Then again they are kept at home in the afternoon to prepare for the evening's sale. Thus they are unfitted for attendance and find it impossible to conform to the discipline of a school organised in the ordinary way. Then again the earnings of the parents are so precarious that they find it impossible to keep up their payments regularly, and thus they introduce bad habits into a school. No, you must have special schools for these children at the lowest rate of payment, opened at hours which will suit their convenience, and conducted by people whom they know, and in whom they have confidence. With regard to the indifference of the parents to their children's education, it may be got over by constantly visiting them and following them up, letting the parents and children see that there is some supervision maintained over them, and that they are cared for, not in fact allowing them to be indifferent. In order to accomplish this there should be a visitor attached to the school, whose sole business should consist in beating up the children, and if we may use the Scripture term, compelling them to come in. We must also bribe them to come in. One of the reasons for not sending them to the school is that they assist the family pot by their scanty earnings. Now, we might meet this by offering rewards of money in the nature of exhibitions to the most regular and deserving, and making it worth the parent's while to keep the child at school. In my costermonger's school I give pinafores, with a red band for the waist, to the most regular. This is cheap, and has been found to answer very well. It has a salutary effect not only upon those selected, but also upon the other children, who are anxious to attain the dignity of an elegant extract.

But it may be asked does not the ragged-school fulfil these requirements? I answer no. In the first place, the name of ragged is distasteful to the poor people, especially to those who have some spark of respectability still flickering in their natures. Then again, the ragged schools, for the most part, are not conducted by people whom they know, and to whom they are accustomed to look up. The teachers, too, and managers, are constantly changing — altogether there is a looseness about them which fails to inspire confidence—doubtless, the ragged-schools have done a great deal of good, they have acted as useful pioneers in preparing the way for a better system, and gradually fitting the lowest classes to mingle on a level of equality with those immediately above them in their own station; but, I am sure that some more powerful and permanent agency is necessary, in order really to get hold of this kind of population, and when the object is to teach them the duties of life, as they ought to be taught.

Then, again, it is all very well to talk about these people going to church, but the fact is, they are neither bodily nor mentally fit to go to church. A man who lives in a crowded room full of children and dogs and pigeons, perhaps engaged all the week in a dirty trade, even if he were to take a warm bath every Saturday night, still his very Sunday best, if he has such a raiment, must get impregnated with the atmosphere he lives in, and he knows and feels that he is not fit to mingle with respectable people; so, even if he would wish to come, he is painfully conscious that church is no place for him, and that the more respectable shun him. I speak from experience, for during the last two or three years a much greater number of these people have attended my church of an evening, and certainly the attendance of pew holders and more respectable people has decreased. It does not matter in my case, because the whole of my parish is composed of this class, and there are very few respectable people in it, so that I am glad to welcome my parishioners, though at a loss of my pew rent, but it is very different in parishes were there is a mixture of clean and unclean. I very much suspect that if the costermongers of London as a body were to take it into their heads to go to church, the tables would soon be turned, and we should see them making a house to house visitation in Hanover-square and Belgravia, with tracts in addition to their lucifer matches, and oranges in their hands, inviting ladies and gentlemen to go to church. Then, again, a man with the scanty education and loose habits of a costermonger, is unable to sit through so long a service, being utterly ignorant of what is going on, and mentally incapable of following the thread of a discourse. We must have rooms for these people where they can be assembled for short prayers and familiar discourses, and among men with whom they are not ashamed to associate. I am quite sure a vast amount of good might be done in this way. Having experienced it in the week days, I am convinced it would answer if it could be adopted on the Sunday. At the same time I feel that it will be almost impossible to work much improvement in their habits while their dwellings remain what they are. The houses of these people in my district are of the most wretched description—houses they are not—mere kennels—and such as should long ago have been condemed by the District Surveyor, but which somehow or other are suffered to escape through the tender mercies of the Paving Board, with a little occasional external whitewashing at cholera time. This, I know, is a most difficult question, for these people are compelled by the nature of their business to live in courts, where there are open spaces and sheds to stow away their barrows and to stable their donkeys. The best method appears to be that lately adopted by the Society of which the noble lord in the chair is president, namely, buying up a whole court or street, and building suitable lodgings for these people, at the same time having regard in the improvements to the trade and habits of the natives.

Then, with regard to the gin palace. Many of these people I know resort to these places because they are warm, and beautifully illuminated and decorated. Here they seek a refuge from the wretchedness of home, and when they enter they see a nice comfortable-looking landlord and a smiling well-dressed landlady, fronted by a row of most inviting clean glasses, and backed by two enormous vats, labelled "Old Tom and Mountain Dew." On the opposite side of the street is a most miserable looking dark, dingy house, called a coffee-shop. I am daily struck by the painful contrast which exists between Flynn's coffee-house and the brilliant Corner Pin in my own district. Now, why should we not make our coffee-shops more attractive, more like the Paris cafés. In that city all classes of people go to the cafés and take their coffee and pipe, together with their *petits verres*, and are content; and I really believe that if we made our coffee-shops more attractive, better lighted, and more highly decorated, and at the same time introduced into them more games, and healthy publications, &c., not omitting a cheerful landlord and an agreeable landlady, which are very essential elements, and not often found in a coffee-shop, the keepers of these establishments generally wearing the miserable and cheek-sunken aspect of teetotalers, I believe that even the lowest class might be attracted to them, and might be drawn away from Old Tom and Mountain Dew, to regale themselves with the decoction fresh with "the spicy gale which blows from Araby the blest." I do not advocate teetotalism, because I am sure all will have, whether they require it or not, some stimulant. Gentlemen who sit at home at ease drink their sherry and port with the greatest composure and satisfaction, but when they come to talk of a poor costermonger or cabman, who is exposed night and day to the most inclement weather, and engaged perhaps in a noxious trade, taking his glass of gin, they look horrified, talk about blue ruin and the misery brought upon the working classes by drink. I do not advocate teetotalism, nor would I deny the costermonger his *pousse café*, but I think that we might make the stimulant less prominent, and not as it were almost force it upon the poor man. I do not enter into the financial part of such an establishment. At first I have no doubt it would be a failure; but if funds were found to start it and keep it going for a time, it might eventually pay; but at all events it might be the instrument of much good, and would repay the loss to the philanthropist in that way, if not in a commercial point of view.

However, I am perhaps now getting a little visionary, so it is time to stop; and I shall conclude by thanking you for your kind attention this evening, at the same time expressing my most sincere regret that the circumstances in which I have been placed have not allowed me leisure to work up my matter more effectually, and to make the paper more interesting.

DISCUSSION.

Mr. Keeling, (of the firm of Keeling and Hunt,) had to thank Mr. Mayhew for his introduction to the costermongers, from the circumstance of his having furnished him with some statistical information for his work on "London Labour and the London Poor," in reference to the particular trade in which he (Mr. Keeling) was engaged. This had induced him to take an interest in that class of persons, and he found that by kindness and sympathy their rugged nature was soon softened. He had encouraged a few to attend his sale-room, and had afforded them the assistance and protection ordinarily extended to more wealthy purchasers, and was glad to say his confidence had not been misplaced. He found they appreciated the good their children were deriving from the education given at the Ragged-schools, but the greatest difficulty they had to contend with was the placing them in life after attaining a certain age. They would gladly apprentice them, but they had not the means, and he (Mr. Keeling) thought that since labour was so constantly sought for by our colonies, if a number of boys and girls belonging to this class could be trained to mechanical, agricultural, and domestic pursuits, they might, by government assistance, emigrate, and be removed from that contamination at home which neutralized the moral influence exercised at schools, confined as many of these families were, to one room for subsistence and existence. The greatest grievance the costermongers reported to him was, the interference of the police whilst pursuing their precarious calling. He (Mr. Keeling) had been in communication with the authorities on the subject, but the different police acts were imperative, alleging that obstructions caused crowds, and gave facilities for pocket-picking. London was not like many places on the Continent, where in open spaces allotted to petty dealers in fruit, flowers, and vegetables, they could pursue their trade without injury to the public, but in this metropolis every inch of ground was wanted, and he confessed he could not see how the difficulty was to be obviated, although it was one that constantly brought them into collision with the police, and the punishment necessarily resulting only served further to degrade them. The profit arising from the sale of their articles was greater than was generally imagined, but he feared much was squandered in vice and dissipation, and it was only by education—by attention to the improvement of their dwellings, so ably advocated on all occasions by the Noble Lord in the chair, and Mr. Rogers, that the position of this class could be ameliorated. Indeed, it would be eventually found that, under an apparently rude exterior, the costermonger had a mind capable of appreciating the advantages bestowed upon him.

Mr. Francis Bennoch expressed the deep interest with which he had listened to this paper. The question was itself a great social problem, requiring much care for its solution. The known kindness and consideration which the firm to which the last speaker belonged had shown to this class of people, deserved the thanks of the community. It was chiefly through the encouragement given by that firm, as he understood, that those costermongers, who had been accustomed to vend the native pippin, had been enabled to take up the more profitable trade of selling pine-apples and other articles of luxury. But he (Mr. Bennoch) would more particularly refer to a branch of the subject to which he had given some personal attention, in connection with the public improvements in London, which affected, to a very large extent, the dwellings of the poorer classes. When he heard of any great public improvement being contemplated—when he heard of hundreds of houses being levelled for the purpose of increasing the convenience of the public traffic—he could not be ignorant of the fact that the destruction of many habitations of the poor was involved, without any provision being made for replacing them. This was a question which excited the deepest sympathy in his mind, and was one which loudly demanded the serious attention of the legislature. When public improvements were carried through particular localities, some provision should be made for the reception of those people who were turned out of their houses, so as to enable them to live near their work. Instead of that being the case, they were driven to dwell miles away from the locality in which they laboured, and they frequently had to walk three or four miles to their work. A few days ago, passing through the neighbourhood of Smithfield, in company with Lord John Russell, he came upon the area of ground known as the Fleet-ditch, where some thousands of houses had been destroyed, and the ground was lying a perfect waste. What had become of the population of that district? They had been dispersed, but not destroyed. The inhabitants of the crowded streets and alleys, formerly existing in that district, must live somewhere. Some of them probably had removed to the neighbourhood of Mr. Rogers, and added to the already over-crowded state of that locality. He (Mr. Bennoch) was of opinion, that to promote mental enlightenment amidst such a condition of things as existed amongst the class under consideration, was almost adding insult to injury, because it would tend to produce a refinement of feeling which would more and more fill them with disgust at a system which compelled them to be so crowded together—and whilst it would give them keen susceptibilities of all that was good in their nature it did not supply a provision for its development. He threw out these remarks in the presence of the noble lord in the chair, because his voice was all potent on the subject, inasmuch as perhaps no man in this country had devoted so much time and labour to the study of the condition of the poor of this metropolis. There was a great social problem to be solved—how could they provide habitations for the labouring poor. The centre of the City was considered one of the most healthy spots in London. Immediately beyond that was a circle containing a festering population, spreading disease, and beyond that again was another circle, where they had cleanliness and health. These circles were being widened day by day by the improvements going on in the centre. It was hopeless to attempt to create a healthy condition of morality whilst they left the social and physical condition of the people so degraded and so ill-provided for.

Mr. George Wallis (of the Government School of Art, Birmingham,) said that there were two points upon which he desired to make a few remarks; upon one he would hope for information, whilst on the other he might possibly make a useful suggestion. It must be a matter of satisfaction to all interested in the great question of education, that the parents of the class, the peculiarities of whose social position Mr. Rogers had been describing, were so deeply interested in the education of their children. Unfortunately, there was this difficulty to contend with, that after the extent of school training which parents of this class were able to afford their children, they could not alway secure such employment for them as would prevent them from falling back into the original position of the parents themselves. The second point to which he wished to allude, was that of providing some really effectual means of counteracting the attraction of the gin-palace and beer-shops, by an improvement in the character of the coffee-shops, as mentioned in the paper. The allusion Mr. Rogers had made to this point, brought to his (Mr. Wallis's) mind an experiment which an eminent glass manufacturer at Birminghan, (Mr. Follett Osler,) had some time ago described to him. No doubt every person present was aware that the process of glass manufacture was a very warm one, and consequently the workmen usually consumed a great quantity of beer. Now Mr. Osler had been constantly annoyed at that, and resolved to try the experiment of a substitute for this incessant "beering," so he adopted a plan by which, he supplied a really good cup of coffee to his workmen at a cheap rate. When this plan was so far matured as to be brought into operation, there was, as a matter of course, some opposition on the part of the confirmed beer-drinkers, but as the experiment progressed the workmen found that the coffee they got at the works was so superior to that which they got in their own houses, that they perferred breakfasting there, and ultimately the coffee took the place of the beer as the working beverage. Now, it appeared to him, that if this change could be effected without compulsion amongst workmen engaged in a manufacture proverbial for consumption of beer, the value of Mr. Rogers's suggestion for the improvement of coffee-shops could not be over-rated. The coffee ordinarily supplied in these places was of the worst description, and could any one wonder that the costermongers went to the gin palace and beer shop. It was to hoped, therefore, that some attempt would be made to provide them with their beverage in a wholesome and palatable form, with such other attractions to the coffee-shop as would give it a chance of competing with the gin palace.

Mr. Hilton had been brought into contact with families of the class under consideration in crowded neighbourhoods. He considered it most important to encourage habits of thrift among men. He thought much good might be done by establishing savings banks, headed by the names of men well known—not as financiers only, but also as philanthropists. He believed it would have a wonderful moral effect upon the class of costermongers generally.

Dr. Aldis remarked that even in the district of Belgravia he had met with the description of dens, or kennels, described in the paper; families were herded together in the most pestilential atmosphere. In such places were to be found the lowest class of fish-dealers, who vended articles unfit for food, and highly dangerous to the public health.

Dr. Waller Lewis said there could be no doubt that it was useless to attempt to do anything for this class of people without first improving their dwellings. It was proved almost to demonstration that a little education without this was a mischief rather than a good. There was very great difficulty in providing dwellings fitted for these people. They all knew that the noble lord in the chair, who had spent so much of his time in thinking and acting upon this subject, some time ago placed a notice on the books of the House of Lords, to the effect that when any large number of dwellings of the poorer classes were swept away by the progress of improvement, the legislature should take some steps to provide dwellings in the place of those which were destroyed, but although it was acknowledged that this intention was—as were all the intentions of the noble lord in this direction—good, yet from the tenure of property and other reasons, which he would not go into, the measure was found impracticable. A great point of difficulty was to know where to erect these dwellings. Many had been erected by the Society for the Improvement of the Dwellings of the Labouring Classes, of which Lord Shaftesbury was chairman, and others had been erected by the Metropolitan Society, and those present who had visited the interior of those dwellings could not fail to be struck with their cleanly appearance and that of their inmates. The difficulty was to find places where to erect such habitations. He could point out one locality which he thought peculiarly available for such a purpose, that was in the neighbourhood of Victoria-street, Farringdon-street, where there was a large vacant space, and he had been told land might be had there at a moderate cost. With reference to counteracting the influence of the gin palace, and doubtless that was very much required, he had last autumn, in company with his lordship, visited an establishment in Paris, at which good unadulterated articles of food, &c., were supplied to the people at a moderate cost, and he was informed that many of the wine shops and cafés in the neighbourhood were abandoned for this establishment which was sometimes visited by as many as 4,000 persons daily; in fact, it produced a good moral effect amongst the workmen of the whole quarter.

Mr. Harry Chester would hardly have ventured to address the meeting on this very interesting paper were it not for an observation which fell from the gentleman who spoke last. He stated that a little education was an evil. He (Mr. Chester) contended that, although a little education was not so good as a great deal, yet that a little was better than none at all. If they looked at small beginnings in education as an evil, they could never hope for great results. They must insert the thin edge of the wedge and drive it home as far as possible. Much as he was interested in Mr. Rogers' paper, he could not help fearing that the amount of humour in it might lead them to lose sight of the deep, earnest purpose which the author had in view. He, (Mr. Chester), and many others present, knew very well how long and successfully Mr. Rogers had laboured for the improvement of the poor people amongst whom his lot was cast. It was his (Mr. Chester's) province to know the exertions which Mr. Rogers had made to improve the condition of these people, and to provide education for this peculiar class of the community, and he had not only done this, but had improved their condition in every respect. He believed the remarks which were directed to this peculiar class were equally applicable to other portions of the labouring community, who had been driven to the lowest pitch of wretchedness. It was the misfortune of our present social condition, that while the higher classes in this country were in a better condition than in any other, the lower classes were more degraded. But after all what was the practical purpose to be gained by this paper? They were not to go away, having been merely amused by a humourous recital of the abject condition of a class of their fellow-creatures, but they were to ask what could they each do amend this state of things? and he felt that every suggestion thrown out—whether for improved coffee-houses or improved homes, had great value. The question of questions was—the improvement of the homes, and while on this subject he wished to call their attention to the important point of the law of parochial rating. He believed it was impossible to have suitable dwellings for the poor in the neighbourhoods where they worked so long as they maintained the present law of parochial rating. The noble chairman had brought these social questions, year after year, before both Houses of Parliament; and though he had gained many battles in the cause, still he had been often defeated. They must support the noble lord who was in the van of this movement, in order to bring about an amelioration of this horrible condition of things.

Mr. Henry Cole, C.B., said there was one point worthy of mention, with respect to Mr. Rogers's schools for the costermongering class, which was, that in connection with these schools he had established some of the most flourishing schools of art that were to be found in any district. The great question, however, was the houses of the poor. He was one of those who thought that education began rather at home than in the schoolroom. It was a happy sign at the present day to find that all classes of the community were thinking how this great question could be met. The evil was not confined to London. In a country parish where he resided during the summer months, a most lovely spot, in the midst of rich resident landowners, he found a state of things existing last year which they would scarcely credit. In a wretched hovel, thirteen people lived in a space scarcely larger than the table at which he stood. Immediately at the back of that wretched den, the proprietor of the place kept no fewer than 40 pigs. He (Mr. Cole) remonstrated with some parochial functionary on the subject, and even took a legal opinion upon the matter, but he found there was no redress, and was told that if he pressed the matter further the people would be turned out and the pigs would be kept there. Should such a state of things be allowed to continue? In many of our large manufacturing towns the employers found it a matter of convenience, as well as, in some cases, of pecuniary profit, to erect at their own cost dwellings in which their own work-people might be concentrated; and they might also go to some of the agricultural districts and they would find such proprietors as the Duke of Richmond insisting that the labourers should have proper cottage accommodation. What they required was that a child should be placed in a condition to be healthy from its birth. Before they sent children to infant schools at three, or to the parochial schools at five or six, they must have cleanliness, which was next to godliness.

Mr. Glaisher, F.R.S., gave some details relative to the wretched condition of dwellings which he had inspected in Plumptre-court, Holborn, which, he said, were worse than the cabins of Ireland.

Mr. Nash expressed his gratification at learning that some movement had been made upon the important question of the improvement of dwellings of the working classes, and for elevating their moral and social condition. He believed that success would attend the efforts that were now being made in this direction, and he considered that the exertions of Mr. Rogers were especially deserving support at the hands of those present.

The Rev. Dr. Booth, F.R.S., believed that it would be impossible to obtain improved dwellings for the poor, to any great extent, whilst the present law of parochial settlement remained in force. At present it was to the interest of parishes not to allow cottages to be built, and until that state of things was altered it was almost impossible that they could have dwellings commensurate with the wants of the poor; for, whilst the population increased, the number of dwellings remained the same. Under the present system of settlement it was a pecuniary advantage to parishes to keep down the building of cottages for the poor as much as possible, and he considered the poor were as much *adscripti glebæ* as in the days of William the Conqueror.

The Rev. James Jackson agreed with Mr. Chester that it was their duty to do all in their power to assist Mr. Rogers in the work he had undertaken. He had made a most noble effort on behalf of a very degraded portion of the community, and he had been the means, not only of improving the condition of the children of that class, but also of the parents through the children. By the aid of government grants, and the donations of the charitable, he had raised large funds towards this object; but as these schools were mainly dependent upon voluntary contributions for support, much yet remained to be done in that direction. There was a good beginning on a large scale, but they must do all they could to assist Mr. Rogers in the noble efforts he had made.

The Chairman said it would have been more agreeable to himself to have closed the discussion without any observations of his own, but as the meeting had shown so much zeal in this cause, in which he had laboured for a considerable period of his life, he could not allow the subject to drop without offering one or two remarks. In the first place he would say that this was a subject with which the Society of Arts had done well to connect itself, because he was convinced that amongst the class of whom they were speaking there were as fine spirits, and as noble intelligences, which by due training could be brought to advance the interests of art and science, as could be found amongst the most wealthy and the best-born of this country. He would remark, in reply to the observations which fell from his friend Mr. Chester, that Mr. Rogers, in drawing up this paper, had given a very fair representation of the characteristics of the class he had been treating of. They were a people of a peculiar character, and it was impossible to be amongst them without being struck with the wonderful patience and good humour which generally distinguished them. With regard to the objection which had been taken by the author of the paper, to the term "ragged schools," he (Lord Shaftesbury) looked upon that title as the chief recommendation of those establishments. The children who came to those schools were of the most miserable class in the metropolis. They came in hungry, shivering, and almost naked, and he adhered with more than ordinary pertinacity to the epithet "ragged schools." It was meant to designate the special class of the community for which these schools were intended. This title also implied the nature of the duty of the superintendants and the teachers in them. The title "ragged school" denoted that the business of the superintendants and teachers was with the ragged children. It was their duty to take the children from the mire and the gutter, and the moment they quitted that they quitted the sphere of their duty. Another important consideration was to keep these schools for the especial benefit of the destitute and miserable classes. Mr. Rogers had said that the title was distasteful to the respectable portion of the community. That he (Lord Shaftesbury) considered was its greatest recommendation. Ragged schools were never intended for the children of those who could afford to pay for schooling. Again, his friend Mr. Rogers was in error when he stated that these schools failed to call forth the respect and the confidence of the children. His lordship then proceeded to detail instances of affection for the teachers and local missionaries displayed by the inmates of the ragged schools, which had come under his own knowledge, and described the wretched state of ignorance and depravity in which they were found, having no idea of the meaning of "property," farther than that they considered it was their right to appropriate as much as they could to themselves. His lordship then went on to remark that, notwithstanding the wretched condition in which this class of people lived, it was astonishing to know what could be affected by the introduction amongst them of a system of thrift. Last year, there was deposited in the penny banks attached to the ragged schools, no less a sum than £2,000. With reference to the condition of the dwellings of the poor, his lordship proceeded to state his conviction that, without improvement in this respect, there could be no hope for their domestic education, so essential as a foundation for moral advancement. The great difficulty in the way of improving the dwellings of the poor in the metropolis and large cities was the great cost it involved. There was no longer any doubt as to the desire of the people to avail themselves of them; but he might remark that when the plan of improving the present dwellings, by making the streets and alleys clean, and properly ventilating the houses, was adopted, it had been found highly remunerative. He was of opinion that by taking whole courts and alleys, renovating, repairing, painting, ventilating, and making them, instead of *cul-de-sacs*, open spaces, free for air and light, ample returns for capital employed might be obtained. His lordship then adverted to the benefits of the Lodging Houses Act, and the importance of assisting to carry out its regulations. His lordship concluded by moving a vote of thanks to Mr. Rogers for his able paper.

A vote of thanks was passed to Mr. Rogers.

The Secretary announced that on Wednesday evening next, the 8th inst., there would be NO MEETING of the Society, and that on Wednesday evening, the 15th inst., a Paper, by Mr. J. W. Papworth, on "Houses as they were, are, and ought to be," would be read.

Home Correspondence.

NATURE PRINTING.

Sir,—In reply to Mr. Bradbury's letter, allow me to state, that I made no claim to novelty in printing from the leaf by means of colours on paper. What I did claim was, printing from the leaf on lithographic stones or copper-plates, and so enabling the impressions to be multiplied at pleasure. Mr. Bradbury considers that, as by his process the impressions are as good as in the specimens of an herbarium, full success in nature printing is achieved. But these are necessarily extremely imperfect, and do not at all represent the natural objects, while I contend that my process preserves the impressions in their original succulence and fulness, and without the unnatural contractions of the withered specimens of a *Hortus siccus*. I am, &c.,

CHRISTOPHER DRESSER.

THE ECONOMY OF FOOD.

Sir,—The interesting and prolonged discussion which followed the reading of the valuable paper of Dr. Letheby, prevented my offering some remarks on this important subject, which is too vast, as has been observed by one of the speakers, to be discussed even in a series of meetings. I shall not attempt, therefore, to enter into the fundamental principles of the question, but merely to offer a few remarks relative to some points susceptible of controversy. Much has been said and written on what to eat and to drink, but very little about how to do it. I have heard several times from persons who have not lived on the Continent, that the English roast beef was more healthy than the French "mess," as our cooking is called by many. I was glad, therefore, to hear it scientifically explained and demonstrated, that a mixture of various articles was necessary to make a wholesome and nutritious food, in order to engender force and to supply the wants of the various organs composing the body. All has not been said, however, on the necessity of admixture. It is well known that the more component parts a substance contains, the more easy is the decomposition, and as the process of digestion has for ultimate result the decomposition of our food, the more this is of a compound nature, the more easily is it digested. But digestion is mechanical as well as chemical, and one of the first conditions is the division of the particles, and their being kept asunder in order to allow the gastric juice to act on every particle individually. The molecules of the same substance having an affinity for each other, they cohere together, thereby preventing the operation alluded to, but when substances of a different nature are introduced into the stomach, the churning or mechanical action of that organ causes the interposition of molecules of different substances, and promotes their chemical decomposition. It is not what we eat which supports the body; it is what we digest. My friend Dr. Kenan, an Irish gentleman, who came to London for the purpose of delivering lectures on physiology, used to say, "There are two kinds of people who die from starvation; those who have not enough to eat, and those who eat too much," and there are very few persons who have not had the opportunity of verifying on themselves the correctness of this remark, by noticing that they felt a great deal weaker from having taken too much of the most nutritious articles of diet. The only condiment alluded to in the paper was salt, and this again is in harmony with the English custom of preferring plain food. We cannot admit, however, that nature produces without design and utility a variety of condiments and spices which we know are not nutritious articles of food, but which are the inert matter destined to keep the particles of food in a state of division, and thereby to promote digestion, first mechanically, and, secondly, by their stimulant and antiseptic virtues. Raspail, the French reformer, says, in his work entitled, "L'Histoire de la Santé et de la Maladie," the art of cooking is the chemistry of the man in health—Pharmacopæia, the cookery of the man who is diseased. Plain food does not produce strength; it gives only bulk. This is the reason why in England you judge of the strength of a man by his weight, but the springing activity of a light Frenchman would defeat an English boxer, unless he was obliged, according to rules, to wait coolly the heavy blow of his antagonist. The same author, speaking of the *modus operandi* of digestion, says, "If you put together, either in an open or close vessel, at a temperature of 10 to 15 degrees centigrade, a mixture of sugar or saccharine and glutinous or albuminous substances, a fermentation takes place, the product of which is alcohol; if, when the whole saccharine substance has been transformed into alcohol, an extra quantity of gluten or albumen remains, its reaction on the alcohol transforms it into acetic acid, and thus when the alimentary matter, by the process of digestion, has arrived at a proper degree of acidity, suitable to the physiological condition of the organ, it is then propelled into the duodenum, where it mixes with the bile, and acquires the alkaline condition requisite to combine with the blood." I am aware that Raspail's opinion has been rejected by some authors, who will not admit that the physiological functions have any similarity with the chemical phenomena which take place out of the organism; for my part, I uphold Raspail's opinion, because chemical phenomena are the consequence of immutable natural laws, and the same causes will produce the same effects either within or without the body. The above remarks will explain how, according to the constitution of the individual, he may secure a good digestion by finishing his meal either with a salad or an extra glass of wine.

I shall beg leave, also, to observe, that Dr. Letheby, in his description of the virtue of coffee is not consistent with his first premises; if there are some absolute conditions required in a substance destined to maintain and support the body, coffee must possess them or it cannot be nutritious. He says that it excites the brain on the one hand, while it calms the nervous system generally; this is not in accordance with the physiological data. He adds that Lechmann, who has inquired much into the physiological effects of that substance, "has ascertained by experiments, that coffee greatly diminishes the wear and tear of the system, it oils the machinery as it were, and checks the waste of friction; for those who use it find, that during active exercise, the destruction of tissue is prevented, and then there is less demand for food; in fact, and with a maximum of work to perform, and a minimum of food to accomplish it, he will best sustain his vital power who has resorted to a cup of coffee." Unluckily, the great authority as the lecturer calls him, is mistaken, otherwise we could live altogether on coffee, and it would certainly, says Lechmann, be a great saving to the poor classes. If I contradict the above statement, it is because it would induce many not only to use, but to abuse, the employment of coffee. It is my principle never to believe or to submit to any kind of authorities however high they may be, unless their opinions agree with the rules of common sense. Now, in opposition to the above statement of Dr. Letheby, I shall relate experiments made by Dr. A. Caron, médecin des prisons de la Seine, and inserted in La Gazette Médico chirurgicale, de Paris, No. 11, March 14, 1846, entitled: De l'alimentation par le café au lait, considérée comme cause pathogénique. Speaking of the popular habit of breakfasting on coffee with milk, he says: I have devoted my attention to this subject, and I think I am justified in attributing to this kind of aliment the production of the nervous and leuchorrhœic diseases which principally affect females of every class, particularly those inhabiting large towns. The very general coincidence of the same symptoms with the use of coffee and milk, induced me to examine what might be the cause of those phenomena, and then I was led to investigate what the action of coffee on milk is, and then the action of that mixture on the human economy. I was first obliged to make the analysis of the infusion of coffee, next to determine its physical and chemical properties; I was obliged besides, to submit my first essays to new experiments, which conducted me to a series of most interesting researches, which I now propose to describe.

The infusion of coffee is a liquor of a dark brown, possessing a particular aromatic taste, slightly bitter, the chemical analysis containing the following principles, viz., a colouring matter soluble in water, a volatile empyreumatic oil soluble in alcohol, which is developed by torrefaction, some tannic and gallic acid, some resin and an extract of cafeine. This liquor when warm and sweetened, constitutes a stimulating and pleasing beverage known by every one, but what no one has thought of is, that when in contact with milk, its nutritious properties are neutralised, because of its fermentation being retarded. Having put together some coffee and milk in a bottle, it was 27 days before the mixture began to decompose, whilst milk and sugar were decomposed in three days; chocolate with milk was five days; pure cafeine and milk eleven days. It is evident that the astringent properties of coffee hinder the digestion of milk; but it happens also, that during the action of coffee on the principle of milk, the cafeine is set free and acts on the membrane of the stomach in the same manner as vegetable alkalies, producing the most evident hyposthenisation, a fact which till now has been overlooked. Then Dr. Caron continues to relate the experiments he made on himself, and some other persons willing to submit to the trial, the results of which were general prostration, vital concentration, cephalagia, weakness and trembling of the legs, tottering walk, nausea supervening with fulness of the stomach, constant somnolence, great want of appetite, he having remained since the morning till 11 o'clock at night without eating anything. But what is particularly worth noticing he adds, is the condition of the pulse, which, on the average, was from 80 to 90, and which, under these circumstances, was lowered to 68. At four o'clock in the afternoon it was reduced to 60, and two hours later to 56, when he took some food in order to stop the effect. While taking the meal he was subject from time to time to giddiness, flushing of the face, and nausea; after the meal the pulse rose to 72, when he felt much relieved. He continues farther on and says, a mixture of coffee and milk as I have stated above, having the property of hindering the fermentation when in vessels, acts identically in the same manner in the stomach, and constitutes an inert liquid, on which the gastric juice has little or no action at all. Dr. Caron continues the account of his experiments, mentioning cases he has treated, and proves ultimately that many patients labouring under nervous irritation, leuchorrhœa and hysteria, were restored to health by simple tonic treatment after having given up the use of coffee. I must confess that in the first instance, when Dr. Caron communicated to me the above observations previously to reading his article, I had some difficulty in agreeing with him on the subject, and told him that from my own experience I thought coffee a great supporter of the animal economy, relating at the same time, that by taking for breakfast a cup of coffee and milk, I could go a whole day without taking anything else; this remark he rightly took as a proof of the truth of what he had advanced. The mistake made by Lechmann does not therefore surprise me, but I think it right to place the fact in its true light. I am, &c.,

J. CAPLIN, M.D.

9, York-place, Portman-square.

Proceedings of Institutions.

Cheltenham.—There have been second courses of lectures, since Christmas, both at the Athenæum and the Literary and Philosophical Institution. At the latter, Dr. Whewell, the master of Trinity College, Cambridge, delivered a lecture, (on Friday, the 27th ult.,) upon *Plato*. The subject itself, and the celebrity of the lecturer, combined to attract a fuller and more educated audience than has been drawn together for many years past. It was not, however, a discourse upon the mental character and philosophy of Plato generally; but a popular illustration of his mode of teaching, in a masterly analysis of the dialogue on "True Courage," and a brief summary of some others. It is much to be regretted that the Institution is at present labouring under pecuniary difficulties. The attempt to support it as a reading-room has failed, and it is now proposed to confine it to the original objects of its founders,—as a Lecture-room, Museum, and Library of Reference.

Darlington.—In the report of the Mechanics' Institution for the year 1856, presented to the annual general meeting, held on the 6th ult., the committee congratulate the members upon the very favourable aspect which the classes have presented during the past year, and are of opinion that the spirited and assiduous manner in which the various gratuitous teachers have fulfilled their self-imposed duties, deserves to be marked with the special approval of the meeting, and the grateful thanks of their pupils. The result of the lectures during the past session is encouraging. The following were delivered:—Six lectures "on the Commonwealth," by Mr. H. Vincent; two lectures "on Extinct Animals of the Ancient World," by Mr. B. W. Hawkins; "The Life of Sydney Smith," by Rev. Brewin Grant; "Literary Beauties of the Bible," by Mr. Barnet Blake; "Moore's Ballads and Shakespeare's Songs," by Mr. Barker; six lectures "on the Protestant Reformation," by Mr. H. Vincent; "Life of John Calvin," by Mr. George Dawson; "Old Books; their uses, beauties, and peculiarities," by Mr. George Dawson; four lectures "on Natural History and the Extinct Animals of the Ancient World," by Mr. B. W. Hawkins; "Some of the Beauties of English Poetry," by Mr. John Harris; two lectures "on America," by Mr. Henry Pease; "Natural History in connection with the late Darlington Polytechnic Exhibition," by Mr. W. Fothergill. Through the liberality of Lord Ashburton, a gratuitous lecture was delivered in September last by the Rev. J. A. D. D'Orsey, on "Common Things." The Saturday evening entertainments have again been brought forward with success. The literary portion of the meetings has been zealously upheld, principally by gentlemen resident in the town, who have delivered short lectures and given select readings of high literary merit—prose, poetical and dramatic—from standard authors of ancient and modern times. The musical portions of the entertainments have been ably sustained by local talent, with occasional assistance from provincial towns. The aggregate attendance at these entertainments during the winter has amounted to nearly 11,000. A "Penny Savings Bank," in connection with the Institution, for the deposit of small sums, has been established. 185 volumes have, by presentation and purchase, been added to the library, and the total number of books belonging to the Institution is 2,429; the issue has been 11,890 against 10,737 of the previous year. The present number of members is 503, of whom 3 are life members, 61 news room, 121 yearly, and 318 half yearly and quarterly. The number entered on the books during the past year is 664. The following gentlemen are the officers for the year 1857: *President*—Henry Pease, Esq.; *Vice Presidents*—Mr. Thomas Watson, and Mr. Andrew Common; *Treasurer*—John Church Backhouse, Esq.; *Honorary Secretary*—Mr. George Brigham; *Committee*—Mr. W. T. Robinson, Mr. Thomas Swinburne, Mr. Wm. Mossom, Mr. E. P. Elgee, Mr. George Shaw, Mr. Nicholas Bragg, Mr. J. F. Clapham, Mr. F. Mewburn, Jun., Mr. R. Mountford, Mr. Edward Pease, Jun., Mr. Richard Winter, Mr. Wm. C. Parker, Mr. John Harrison, Mr. Wm. A. Snaith, Mr. Edward Hall, Mr. J. R. Breckon, Mr. Jonathan Dresser, Mr. Wm. Forster, (Bank), Mr. H. K. Spark, Mr. R. Pincher; *Auditors*—Messrs. G. Harker, R. Teasdale, and H. Dunn; *Scrutineers*—Messrs. T. L. Blyth, and H. F. Pease; *Librarian*—Mr. Charles Forster.

Lewes.—An Exhibition and *soirée* in connection with the Mechanics' Institution, were held on the evenings of Thursday and Friday, the 26th and 27th Feb., when an interesting and varied collection of works of art and other objects of interest was displayed. The walls were hung with some fine pictures by the old masters, as well as some scientific diagrams; and cases of specimens illustrating various branches of Natural History, occupied a portion of the space. A choice collection of antiquities was contributed by the Sussex Archæological Society, as well as from other sources. Several tables were devoted to the illustration of various branches of physical science, and experiments in frictional and voltaic electricity, magnetism, and chemistry were shown during the evenings. Electric telegraphs were arranged at the ends of the hall, and their working was shown and explained. In the mechanical department, there were several interesting machines exhibited in actual operation, and the steam-engine was explained and illustrated by working models. The attendance on both evenings was very large.

Salford. — The Committee of the Salford Royal Museum Peel-park Institution have had their attention directed, for some time past, to the formation of an Industrial Museum, that shall in a great measure relate to the manufactures of Manchester and its neighbourhood; with this view, they desire to procure a complete series of samples of the raw materials, and of those exhibiting the various changes in the process of manufacture, so as to form a collection fully illustrating the different branches of practical art and manufacture. The importance of such a collection, from whatever view it may be considered, especially in this district, is unquestionable; and the Committee feel satisfied, that the completion of an Industrial Museum, on a large and ample scale, would have a beneficial tendency and value to all classes, and possess special attractions to the strangers who may be expected to visit Manchester during the present year. The Committee have much pleasure in acknowledging the valuable contributions with which they have been already favoured by several eminent manufacturers of textile fabrics; these have been arranged, and have proved a source of instruction and gratification to a large number of persons who have visited the museum. In carrying out this important object, the notice of the Committee has been drawn to the extensive and valuable collection of samples of practical art, industrial products, and other objects displayed in the Inaugural Exhibition of the Manchester Mechanics' Institution; and they have been advised that, at its close, many of the contributors to that exhibition, if applied to, would be willing to transfer to the Museum, at Peel-park, such of the objects as are of a suitable and appropriate character, being assured that all such donations would be safely taken care of, for the permanent use and enjoyment of the present and future generations. The Committee do not deem it necessary, in every case, to specify the particular objects which they think it desirable to solicit, but respectfully leave the selection to the judgment and liberality of the contributors, feeling assured that they will be the most competent to select such samples as are necessary to illustrate each particular branch of practical art and manufacture. The Royal Museum and Library is established under the provisions of the "Public Libraries Act," which empowers the Town Council to levy a rate for its maintenance and support. All its property is vested in the Town Council of Salford, and it is open daily (except Sundays) to the public, free of charge. The library contains nearly 20,000 volumes, of which 6,000 (forming the lending department) are freely lent to be read at the homes of the borrowers. Within a period of seven years the aggregate issues of books have been 431,974 volumes. The reading-room has been used by 696,000 readers, and the extensive Museum has of itself attracted more than 20,000 visitors within the seven years. These numbers may appear somewhat large, but when it is considered that within the most popular public park in this great community, situate in a very picturesque locality, is to be found an Institution with so many attractive features —containing a large library, spacious and pleasant reading-room, a museum filled with statuary, pictures, and other works of fine art, a gallery of samples of practical art and manufacture, an exceedingly good collection of specimens of foreign and British natural history, antiquities, and general articles—all of which are entirely free, and to which, during the holiday season, thousands of persons are brought by railway from the neighbouring towns, they will not cause much surprise, but be regarded as a certain indication of the good which result from this wide diffusion of knowledge amongst the masses of the people. The numerous donations conclusively evince the warm interest taken by the public in the Institution, no less that 2,571 separate gifts having been made from time to time, and the sum of £10,000 subscribed towards the formation of the library and museum, for its enlargement, or for building purposes. The rapid growth of the Institution has been very great, and the necessity of providing for the increase of objects in the museum rendered it necessary, a few years back, to make large alterations in the old building, and to erect the north wing, corridor, and staircase; subsequently, in June 1856, the south wing was commenced, and is nearly completed; it will open with an exhibition of paintings, the works of local artists. By this recent addition to the Museum, at a cost of nearly £3,500, the Committee have doubled the extent of space available for the purposes of the Industrial Museum, to complete which their exertions are now especially directed.

To Correspondents.

Erratum.—Page 291, col. 2, line 18, for "undisturbed" read "undistorted."

MEETINGS FOR THE ENSUING WEEK.

Mon. London Inst., 7. Rev. H. Christmas, "On the History and Antiquities of Heraldry; and on some other branches of British Archæology."
Chemical, 8.
Entomological, 8.
Tues. Civil Engineers, 8. Mr. F. R. Conder, "On the Laying of the Permanent Way of the Bordeaux and Bayonne Railway, across the Grandes Landes."
Linnæan, 8. Prof. Owen, "On the Character and Subdivisions of the class *Mammalia*." Part II.
Pathological, 8.
Wed. Literary Fund, 3.
London Inst., 3. Mr. E. W. Brayley, "On Mineralogy and Crystallography."
Archæological Association, 4. Anniversary.
Geological, 8. Dr. H. Falconer, "On the series of Mastodon and Elephant occurring fossil in England."
Graphic, 8.
Thurs. London Inst., 7. Rev. C. Boutell, "On the Monumental Memorials and Engraved Monumental Brasses of Great Britain."
Sat. London Inst., 3. Prof. Robert Bentley, "On Systematic Botany, with especial reference to the natural systems of arrangement."
Royal Botanic, 3¾.
Medical, 8.

PATENT LAW AMENDMENT ACT.

APPLICATIONS FOR PATENTS AND PROTECTION ALLOWED.

[*From Gazette, March* 27*th*, 1857.]

Dated 5th January, 1857.

38. Henry Alfred Jowett, Sawley, Derbyshire—Improvements in steam engines.

Dated 20th January, 1857.

163. Alfred Vincent Newton, 66, Chancery-lane—An improvement in the manufacture of hosiery. (A communication.)

Dated 18th February, 1857.

477. Thomas William Davenport, Ormond-street, Birmingham, and Samuel Cole, Wilton-street, Aston Manor—A new or improved method of manufacturing and ornamenting articles in papier maché and charcoal.

Dated 20th February, 1857.

503. Isaac Aldebert, 57, Long-acre—An improved shackle for the springs of carriages.

Dated 28th February, 1857.

594. Peter Armand le Comte de Fontainemoreau, 39, Rue de l'Echiquier, Paris—Improvements in finger and other rings. (A communication.)

Dated 3rd March, 1857.

617. Giacomo Sileoni, Genoa—Obtaining starch from a plant called arum maculatum and arum Italicum, and from all other roots and plants of the arum genus.

Dated 4th March, 1857.

630. Rudolph Bodmer, 2, Thavies-inn—Improvements in apparatus for steering ships. (A communication.)
634. Thomas Wright Gardener Treeby, 1, Westbourne-terrace-villa—Improvements in sewers and gulleys, and outfall to sewers and gulleys, and of sewage.
636. William Edward Newton, 66, Chancery-lane—Certain improvements in machines for cutting standing crops. (A communication.)
638. James Stephens, 8, Northampton-road, Clerkenwell—Improvements in paint brushes, and in similar kinds of brushes.

Dated 5th March, 1857.

640. William Frederick Taylor Bradshaw, 54, Thomas-street, Sheffield—Improvements in making palette and other like knives.
642. Jean Louis Frederic Bardin, Paris—A new mode of ornamentation.
644. William Holland, Birmingham—A new or improved manufacture of runner notches and top notches for umbrellas and parasols.

654. George Tomlinson Bousfield, Sussex-place, Loughborough-road, Brixton—Improvements in machinery for compressing clay and other materials applicable to the manufacture of bricks and other articles. (A communication.)

Dated 6th March, 1857.

658. William Findlater and William Keetley, Birmingham—An improvement or improvements in carriages.

660. Georges Danré, Pierre Fortune Victor Mouillard, and Pierre Adrien Mercier, Paris—Improvements in carbonizing or distilling wood, peat, oil-cake, coal, and other substances for the production of gas for lighting, in carburetting or increasing the illuminating effect of and in compressing gas, also in the apparatuses employed for such purposes.

662. Richard Archibald Brooman, 166, Fleet-street—Improvements in furnaces and fire-places. (A communication.)

Dated 7th March, 1857.

666. George Hawksley, Bromley, Middlesex—An improvement in constructing apparatus for heating and cooling air, steam, and other fluids.

668. William Urquhart, 481, New Oxford-street—A new mode of ornamenting household furniture.

670. Robert James Maryon, 40, Hooper-street, Westminster-road—Improvements in the construction of steam locomotive engines.

671. Patrick McGrade, 7, Upper Liffy-street, Dublin—Improved machinery or apparatus for propelling ships or boats.

672. Richard Archibald Brooman, 166, Fleet-street—An improved method of, and apparatus for, maintaining the water level in boilers. (A communication.)

Dated 9th March, 1857.

677. Frederick Shand Hemming, Westminster—Improvements in the manufacture of railway chairs and sleepers.

Dated 11th March, 1857.

703. George Mountford, Caledonian-terrace, Leeds—Improvements in machinery or apparatus for cutting or chopping loaf sugar, roots, and other substances.

705. Charles Emile Giajola, No. 2, Sheepcott-lane, Birmingham—Improvements in moderator lamps.

707. William Boden, Blackwall—Improved apparatus for flushing waterclosets and urinals.

709. William Hale, Swan-walk, Chelsea—An improvement in rolling iron and steel.

Dated 12th March, 1857.

711. Joseph Jules Derriey, Paris—Improvements in machines for manufacturing lozenges, wafers, or pastilles of pasty materials.

713. John Avery, 32, Essex-street, Strand—An improved method of purifying schistous or bituminous oils. (A communication.)

715. George Travis, Mercaston, Derby—Improvements in apparatus used in the manufacture of cheese.

717. William Edward Newton, 66, Chancery-lane—Improved machinery for drawing and preparing silk, cotton, wool, flax, hemp, and other fibrous substances. (A communication.)

Dated 13th March, 1857.

719. Thomas Horne, junr., Birmingham—A new or improved method of ornamenting metallic bedsteads and wash-hand stands.

721. Samuel Lawrence Taylor, Cotton-end, and Thomas Eaton Rolfe, Northill, Bedfordshire—Improvements in boilers for generating steam, heating water, and for other heating or boiling purposes.

723. William Westbrooke Squires, Liverpool—Improvements in the means of letting on and drawing off water and other fluids.

725. Edmond Joseph Nicolas Juvin, Paris—Improvements in producing printing surfaces.

Dated 14th March, 1857.

727. John Wheatman and John Smith, Sheffield—Improvements in the mode of grinding circular saws.

729. Henry Bridges, Bridgewater—Improvements in buffing, bearing, and draw springs, and buffer cases for railway purposes.

731. Martin Nunn, Hampstead—Certain improvements in machinery or apparatus for washing or cleansing clothes, piece-goods, and other articles.

733. Thomas Bowden, Pendleton, Lancashire—Improvements in apparatus for discharging the water resulting from the condensing of steam used in apparatus heated by steam.

Dated 16th March, 1857.

737. Henry Glaysher, Isle of Wight—Improvements in steam-engine boiler and other furnaces.

739. George Joseph Hall, 10 and 11, Archer-street, St. James—An improvement in finishing fabrics made wholly or partly of silk.

741. Richard Archibald Brooman, 166, Fleet-street—Improvements in zincing or coating metals with zinc, and in cleaning metals. (A communication.)

Dated 17th March, 1857.

743. Nathaniel Jones Amies, Manchester—Certain improvements in machinery or apparatus for polishing and finishing yarns or threads.

745. Henry Boswell Palmer, Bermondsey—An improved fire lighter.

749. William Edward Newton, 66, Chancery-lane—Certain improvements in folding window blinds and shutters. (A communication.)

751. Modeste Anquetin, Paris—An improved traveller's watch.

753. William MacNaught, Rochdale—Certain improvements in engines worked by steam or other motive power, and in their gearing for connecting them with machinery, and in the means of lubricating such engines.

755. George Forsyth, Stakeford Foundry, Maxwelltown, N.B.—Improvements in steam cooking apparatus.

Dated 18th March, 1857.

757. John Millar, Edinburgh—Improvements in stoppers or closing apparatus for decanters, bottles, and other receptacles.

759. Jacob Green, Philadelphia, U.S.—Improvements in gas consuming furnaces, and in the automatic action of the controlling valves or dampers of the said furnaces.

761. James Murdoch, Staple-inn—An improved process for imitating the skins of animals upon fulled cloth. (A communication.)

763. John Wilkes, Thomas Wilkes, and Gilbert Wilkes, Birmingham—A new or improved manufacture of rollers or cylinders for printing fabrics.

765. Sir James Caleb Anderson, Bart., Fermoy, Cork, Ireland—Improvements in locomotive and other carriages.

767. Richard Johnson, Manchester—Improvements in cleaning iron and other metals, after the manner known as "pickling."

WEEKLY LIST OF PATENTS SEALED.

March 27th.

2264. John Boyd.
2266. William Smith and Nathaniel Fortescue Taylor.
2270. John Rothwell.
2274. Charles John Carr.
2278. David Thom and George Aldcroft Phillips.
2280. John Lord.
2283. Charles William Ramié.
2289. Duncan Bruce.
2296. Henry Naylor and James Crabtree.
2300. Charles Durand Gardissal.
2344. William Wilkinson.
2380. William Rennie, junr.
2442. Robert Hanham Collyer, M.D.
2456. Joseph Lacassagne and Rodolphe Thiers.
2474. George Thomson.
2560. Francis Cook Matthews.
78. Robert Smith.
98. George Fergusson Wilson.
112. John Barsham.
164. Frederick Crace Calvert.
210. George Fergusson Wilson.
212. George Fergusson Wilson.
248. Thomas Cooke.
276. Alexander Wright.
304. Matthew Andrew Muir and James McIlwham.

March 31st.

2307. Joseph Renshaw.
2308. Victor Renault.
2309. Daniel Desmond.
2311. Robert Edmeston.
2312. Charles Goodyear.
2313. Michael Thomas Crofton.
2335. Andrew Dunlop.
2349. William Marriott and David Sugden.
2369. Joseph Bennett Howell.
2405. Thomas Allen.
2425. Peter Armand le Comte de Fontainemoreau.
2426. Peter Armand le Comte de Fontainemoreau.
2427. William Dray.
2437. Samuel Cunliffe Lister and William Tongue.
2438. James Robert France.
2440. William Palmer, junr.
2487. John Christian Bremer.
2495. Edwin Allan Athawes.
2504. Louis Auguste Mangin.
2523. Michel Dognin.
2526. Adolphe Ernest Ragon.
2579. John White.
2581. Ebenezer Erskine Scott.
2635. Jean Baptiste Edouard Victor Alaux.
2650. William Clark.
2799. John Musgrave, junr.
2831. Joseph Latimer Clark.
2893. William Hooper, Joseph Fry, and George Nasmyth.
3074. William Clark.
31. Alexander Angus Croll.

Patents on which the Stamp Duty of £50 has been Paid.

March 23rd.

699. James Robertson.
756. George Fergusson Wilson and William Walls.

March 24th.

694. Samuel Humphreys.
709. James Alexander Manning.
793. Simon O'Regan.

March 26th.

733. Philip John Bassavant and John Cure.
739. Archibald Douglas Brown.
752. John Henry Johnson.
819. William Rigby.

March 28th.

761. Richard Edward Hodges.
785. Stephen Randoll Smith.

WEEKLY LIST OF DESIGNS FOR ARTICLES OF UTILITY REGISTERED.

No. in the Register.	Date of Registration.	Title.	Proprietors' Name.	Address.
3960	March 25.	Improved Chimney-top for preventing down draughts	Wm. Blair and Joseph Chappell	Bolton, Lancashire.
3961	,, 26.	The Westonian Tie	Foster, Porter, and Co.	Wood-street, Cheapside.
3962	,, 27.	The Registered Expanding Travelling Bag	Jacob Lyons and Sons	10 and 11, Wilson-street, Finsbury.
3963	,, 28.	Safety Harness	James Taylor	Barnby Moor, Yorkshire.
3964	,, 28.	Bowden's Transparent Disk Advertiser	Mark Bowden and Co.	Bristol.
3965	,, 30.	Sack Lifter and Weighing Machine combined	John Spencer	West Butterwick, Lincolnshire.

Journal of the Society of Arts.

FRIDAY, APRIL 10, 1857.

◆

NOTICE TO CANDIDATES.

Persons who intend to offer themselves as Candidates at the Society's Examinations in June next, in London and at Huddersfield, are desired to take notice that no one will be admitted to the Examinations who shall not have sent in his "Return paper" to the Secretary of the Society of Arts, before Monday, the 20th of April next.

Forms of the "Return paper" may be had on application to the Secretary of the Society of Arts.

EXHIBITION OF INVENTIONS.

The Society's Ninth Annual Exhibition of Inventions was opened on Monday, the 23rd ult. The Exhibition will be open every day till the 23rd of May, from 10 a.m. to 4 p.m., and is free to the members and their friends. Members, by tickets or by written order bearing their signature, may admit any number of friends.

NOTICE TO INSTITUTIONS.

James Patrick Muirhead, Esq., F.R.S.E., has presented to the Society of Arts, for distribution amongst the Institutions in Union, 27 copies of "Correspondence of the late James Watt, on his Discovery of the Theory of the Composition of Water," and 186 copies of "The Historical Eloge of James Watt," by M. Arago.

Those Institutions which desire to have copies of these works, are requested to make early application to the Secretary of the Society of Arts.

SPEECHES AND ADDRESSES OF H.R.H. PRINCE ALBERT, PRESIDENT OF THE SOCIETY OF ARTS.

At the annual dinner of the Society for the Encouragement of Arts, Manufactures, and Commerce, in the Crystal Palace, on the 24th of June, 1856, Lord Ashburton, Vice President of the Society, in his address from the chair, observed:—"To induce the tired mechanic to study during his hours of rest, he must have some inducement beyond that of acquiring knowledge for its own sake; he must be paid for it in wages or in consideration, and that inducement he cannot hope for from ignorant employers. Prince Albert has felt this difficulty; a difficulty not within the compass of this Society to remove: and he has brought up succour to us from other quarters. He assigned to science and high art its due place in the hierarchy of society; he has encouraged our scientific and artistic institutions, but above all he has adopted that course which among Englishmen is of most avail,—he has attended our public meetings, and has in his own person appealed to us to reform ourselves. These appeals at the time produced their effect, and would continue to work upon the public mind, if this Society would in its own interest, and in the interest of the cause it espouses, print and circulate Prince Albert's addresses for our use."

At a meeting of the Council of the Society of Arts, held on the 23rd of July, 1856, the foregoing suggestion was taken into consideration, when the following minute was passed:—

"That Lord Ashburton's suggestion, to collect and publish the addresses, speeches, and letters of H.R.H. the President of the Society, having been considered, it was resolved:—That a collection be published, not at the risk of the Society, but by subscription among the members, the Institutions in Union, and the public at large, as being the best means of showing the public sense of the efforts made by his Royal Highness to promote social progress and the Encouragement of Arts, Manufactures, and Commerce, the chartered objects of the Society.

"That two editions of the collection be published under the sanction of the Society, the one a cheap edition for wide distribution, and the other a library edition.

"That members and others wishing to become subscribers be requested to transmit to the Secretary a statement of the number of copies they subscribe for, with the amount of their subscriptions."

It is proposed to publish the Library Edition at half-a-guinea, and the cheap edition at threepence each, or one pound per hundred.

Subscriptions to promote the above object will be received by the Secretary.

ADVICE TO CANDIDATES.

The following letter, addressed to the editor of the *Journal*, has been received from a member of the Board of Examiners:—

Sir,—As the time of holding the Society's Examinations is now drawing near, and as many, indeed I may say most, of the candidates know but little of the manner in which Examinations are conducted, whether at the Universities, by the Civil Service Examiners, or elsewhere, it may not be out of place if I use the columns of the Society's Journal, to give a few words of friendly advice to those young men who propose to present themselves for examination before the Society's examiners in the beginning of June. My remarks will be very plain, intended as they chiefly are for those who do not clearly know what an examination is, or how they should conduct themselves with respect to it.

In the first place it will be found that candidates, especially those who have had but little judicious guidance, are only too ready to take up several subjects at once. They think it creditable to them to be able to compete in so many things at the same time. This is a great error. A candidate who confines his attention to one or even two subjects, is almost sure to obtain a higher certificate, than he who spreads his attention over many; but, what is of far more importance, his thoughts being concentrated on one point at a time, he acquires clearer notions of the primary principles of the subject he is striving to acquire than if he were to direct his attention to several at once. It is as true of mental as of mechanical effort; to produce an effect at all, a certain time is necessary. The mind must be saturated with a subject, before it can be said to make it its own. Again, in an examination, a candidate must not only know the subject, he must have it well in hand besides; it will be of no avail to him to know where he could find the information he is in want of, if he had a library to refer to. He must not only have the knowledge, but be able to make it available, and recover it if he should have lost it.

As several of the subjects of examination are valuable not only in themselves, but also as mental exercises—mathematics, for example, it is obvious that if they are not followed to some considerable extent, they will fail to come up to the latter requirement, however they may satisfy the former. For instance, to store up in the memory the results which may be found in a book on Mensuration, will supply information useful so long as it remains distinct and clear—but no longer; while as an exercise of the understanding it will be of little or no value. Loose and inaccurate information on any subject is never worth much, and it is sometimes positively injurious. The true principle is to take up one subject, to work it, to leaven the whole understanding with it, and then to go on to another.

There is another great error into which candidates not unfrequently fall, and which savours somewhat of dishonesty. I mean the practice of giving evasive answers, of dodging the question, if I may be allowed to use a vulgar but expressive word, of fencing with the examiner, and striving to mask special ignorance or loose information under vague generalities. The honest, and indeed the safe course for a candidate to follow, when he cannot answer a question, is to pass it by; a guess may reveal a depth of ignorance of which otherwise the examiner would have had no conception.

Again, many persons, through nervousness and timid apprehension, imagine that it must be a very difficult matter to answer an examiner's questions. Now, to one acquainted with the subject under examination, the difficulty is not so great, after all. Questions, which at the first glance appear to be very difficult, gradually open out to a little patient thought. Besides, I know that it is the determination of the examiners generally not to set riddles or conundrums in any of the subjects, but to give those fair and direct questions which test knowledge rather than ingenuity—which prove whether an examinee has mastered the principles of the subject, or whether his acquaintance with it is loose, superficial, and popular, such as a man might acquire by attentively listening to another talking about it. Those candidates who propose to come to the Society's Examinations next June, well read and carefully prepared in the subjects they mean to bring up, will not only receive the reward due to their industry and talents, but they will be the means of inducing and urging many others to go and do likewise.

I am, &c.,

A MEMBER OF THE BOARD OF EXAMINERS.

EXAMINATIONS.

The following correspondence has taken place upon this subject:—

To the Secretary of the Society of Arts.

Sir,—I find it necessary to make an appeal to you in reference to the proceedings and the results of the preliminary Examination, held at ________________ on ________________ the ________ of ____________

After becoming connected with the Society of Arts, I dedecided to send in two youths as competitors, one for Mathematics and History, and the other for French and German, being, of course, guided by your printed regulations as sent to me. The two youths consequently attended the Examinations at ________________ and one of them was plucked for the reason assigned in the enclosed letter of the Rev. ________________

Now, the printed paper sent me did not mention arithmetic for the preliminary Examination; therefore, as the youth referred to intended to go in finally for modern languages, his attention had been exclusively directed to those subjects, with English composition and commercial correspondence.

In consequence of the altered plan, I considered the youth was placed in a false position, especially as we were guided by the printed regulations sent me. It was, therefore, no fault of ours, and as the youth would be sure to distinguish himself, I hope he will be allowed to present himself for Examination at Huddersfield. As to his arithmetic, I will guarantee his being efficient in that department before June. You will, therefore, oblige me by bringing this case before the Board of Examiners in London.—I am, Sir, yours most respectfully.

————.

(Reply.)

Sir,—Your letter of the 3rd inst. has been carefully considered, and I am directed to state in reply to you that the Council cannot interfere with the discretion of the Local Board, which they must assume to have been judiciously and properly exercised.

Independently of this, I would observe that one of the principal objects the Society of Arts had in view in establishing a general system of periodical examination for those who attend classes at Mechanics' Institutions, and for such of the middle classes as desire to avail themselves of the advantages they offer, was to secure, if possible, that a greater amount of attention should be given, as well by teachers as by pupils, to the common and indispensable elements of a sound education, however restricted in extent it might happen to be. Surely every lad on leaving school ought to be able to write a fair hand, to spell correctly, to revise simple mistakes in English composition, and to work easy sums in the common rules of arithmetic. That a great many youths at the present day are grossly deficient in these, the very first rudiments of education, they have the large and varied experience of the Civil Service Examiners to confirm their own observation. They do not believe that any proficiency, however great, in modern languages, could compensate a lad for his ignorance of these elementary principles, on which all sound education must be based.

I am, Sir,

Your obedient servant,

P. LE NEVE FOSTER,

Secretary.

Society of Arts, Adelphi, W.C., April 8th, 1857.

To————

LOCAL BOARDS OF EXAMINERS.

A Local Board of Examiners, to conduct the preliminary examinations required by the Society of Arts previous to the general examinations in June, has been appointed by the Bradford Mechanics' Institution for that district.

The members of the Board are—

Rev. S. G. Green, B.A.
Rev. D. Frazer, M.A.
Rev. H. B. Creak, M.A.
Mr. William Clough.
Mr. C. Lund.
Rev. W. R. Smith, M.A.
Mr. Alfred Harris, Jun.

Home Correspondence.

THE ECONOMY OF FOOD.

Sir,—I have read with great pleasure the interesting and instructive paper delivered by Dr. Letheby to the Society of Arts on the economy of food. That paper contains information which may be turned to good account in every domestic establishment, which may be made beneficially available by those whose duty it is to provision our fleets and armies, and which deserves the serious consideration of the superintendents and inspectors of hospitals, gaols, and poor-houses. Dr. Letheby mentions the different articles of diet which form the staple food in different countries, and he says, "everywhere the pulses and leguminous seeds are cultivated for their rich nitrogenous qualities." In Yucatan, and throughout the whole of Central America, black beans form a large portion of the daily food of the inhabitants, particularly the Indians. These beans, which are called *frijoles*, are, when uncooked, about the size and colour of parched coffee berries. They are boiled and eaten with pepper and salt, and are served up at breakfast, dinner, and supper. Some of the natives almost live upon them, and they are to them as necessary an article of food as maccaroni is to the lazzaroni of Naples. I had the pleasure of being first introduced to this dish about ten years ago, whilst spending a fortnight at Omoa. When it was placed upon the table it did not present a very attractive appearance, and my first impression was that it was some villanous preparation of blood, extracted from a foul street-feeding porker, or not impossibly from the veins of an Indian. Having been assured that it was vegetable, and not animal diet, and, moreover, that it was wholesome and good for food, I ventured to taste it, and found it far from being unpalatable. Like many things, and persons too, at first exciting our antipathy, it improved upon acquaintance, and I ceased in a short time to wonder that the natives should not only be passionately attached to it, but that they should get fat upon it. It is extremely unctuous, and is, I have no doubt, very rich nitrogenous food. There is another favourite article of food amongst the Indians of Yucatan. It is a small thin cake, about the size of a saucer, made of the meal of the maize, or Indian corn, and called a *tortilla*. This, when roasted, somewhat resembles the oatcake of Scotland. For a glass of anniseed and a toasted tortilla, an Indian would go through fire and water. He certainly would not hesitate to commit a crime. Not a very long time ago an Indian, on the very lowest grade of humanity, was convicted of murder. The victim was his wife. They were seen standing together at the door of their hut, apparently engaged in quiet converse. Suddenly the man was observed to seize a knife, and, as quick as lightning, to plunge it into her heart. She fell upon a log, quivered for an instant, like a reed when shaken by the wind, and expired. The wretched criminal looked at the corpse with perfect unconcern, and when arrested, which he was immediately, walked cheerfully away as if he was going to his breakfast. Never did I behold such a picture of degraded humanity as this poor creature presented. No beam of intelligence in his face, no speculation in his eye, no working of the facial muscles betokening emotion of the slightest kind. A long face, a lofty but rather crooked narrow forehead, high cheek bones, a thin delicate nose, compressed at the nostrils, a small mouth, a retreating chin, and a complexion dun-coloured and cadaverous. In short he had all the physical indications of an idiot. But he was not an idiot, and he had not mind enough to be mad. He was simply a human being without the slightest mental cultivation. A laborious attempt was made during the time he was in gaol, to instil into his mind some knowledge of Christianity, and to impress him with the sense of his awful situation. Father Avaro, a member of the order of Jesus, a zealous, pious, and benevolent man, attended him day and night, and thought that he had made him understand and feel, what was needful for his salvation. On the morning before his execution, a few minutes before he was led out, he told the priest, in as solemn a manner as he could, that he had one last request to make to him. This occasioned no little surprise; the good man's eye moistened, and his countenance was irradiated with hope; could it be possible—had the light of Heaven come upon this wretched creature's benighted mind now at the last moment; had intelligence beamed upon his intellect, now when the soul was beating, as it were, against the bars of its cage, and was about to be released; and would he, could he, embrace the cross and be saved? Such things had happened; his church's annals were full of miracles as great and greater. What was his request,—assuredly, said the kind Jesuit, it should be complied with, if not inconsistent with his duty. What was this last solemn request? "Please to get me a toasted tortilla?" A toasted tortilla was got for him; he was led to the scaffold eating it; and he was hanged with an unmasticated piece sticking out of his mouth.

There is a dish which used to be generally used in the West Indies, but I believe, it is now almost confined to British Guiana. It is called Pepperpot. It is a sort of *omnium gatherum*, a kind of *olla podrida*. Pepperpot is compounded in this wise: a large earthenware vessel is procured, and into it is placed the relics of the breakfast, the luncheon, and the dinner, from day to day and from year to year, with the addition of a small quantity of cazarife, or cazareep, and a liberal allowance of fresh red peppers. Whatever is left after a meal, legs and wings of chickens, drum-sticks of ducks, backbones of turkies, bits of fish, ham, beef, mutton,

> "Eye of newt, and toe of frog,
> Wool of bat, and tongue of dog;
> Adder's fork, and blind worm's sting,
> Lizard's leg, and owlet's wing;"

all, all, are cast, with reckless indifference, into this witches' cauldron, and warmed up together. The conditions of a true pepperpot are these principally:—First. The vessel must be put upon the fire and stirred up every day. Second. It must never be emptied and washed out. That would break the charm. Third. A small portion of cazarife, to give the compound a homogeneous flavour, must be added every day. Cazarife is a preparation of the juice of the cassava root, and is slightly poisonous, but that is of no consequence. There are families in British Guiana to whom pepper pots have descended from time immemorial, and which, from the period they commenced their savoury career have never been polluted by being brought into contact with napkin, or water. Were some of the jars examined, it is not impossible that some northern rhyme in Runic characters, or pithy apopthegm, in Mexican hieroglyphics might be discovered. I have had the courage to taste this celebrated dish, and although I have heard it spoken of in the highest terms, I should respectfully decline to give it my vote and interest.

Dr. Bankroft, in his "Essay on the Natural History of Guiana," published in 1769, speaking of the Indian cookery, says: "Their usual method of cooking all animal food is by boiling it, either with water, or the juice of the poison Cassava, to which they add such a quantity of red pepper, as would instantly excoriate the mouth of a person unaccustomed to its use, but it is indispensably necessary in this climate to corroborate the solids and promote digestion, which would otherwise be imperfect; though it is a general but mistaken opinion, that the copious use of spices is detrimental to the inhabitants of hot climates, whereas nothing is more productive of health, and we find that nature has not only produced them more particularly in these climates, but taught the inhabitants their use; and not only the Indians of America between the tropics, but the inhabitants of Africa and the East, all season their food with a great quantity of spices, particularly pepper, a practice in which they are likewise imitated in a greater or less degree by all the Europeans who have resided in those countries long enough to acquire the knowledge of its use. By this practice the Indians wholly preserve themselves from those intermitting fevers which are endemial to the other inhabitants of Guiana, who do not imitate them therein. But though the Indians live in the excessive use of pepper, they are never afflicted with the gout, notwithstanding the humidity of the air renders it particularly troublesome to those of the white inhabitants who have transported it from Europe, and I think that spices ought to be no longer enumerated among the predisposing causes of that disorder."

Dr. Bankroft gives an interesting account of the Cassava, and the mode in which it is prepared. He says, "The cassava shrub is about four feet in height, knotted, and covered with an ash-coloured bark. Within it is pithy. Near the top it divides into several short, small green branches; from these arise reddish foot-stalks, about six inches in length, supporting large digitated leaves. The root is white, soft, and farinaceous, of a cylindrical form, nearly a foot in length, and five or six inches in circumference. This root is grated, on large copper graters, into coarse meal, from which its juice is separated by expression. This meal is then put on large plates of iron, placed over a slow fire, and formed into circular cakes of different magnitude, and from one to four lines in thickness; on these plates it is baked, until the surface becomes brown, and it will then keep sweet and wholesome for many months. But, notwithstanding this is the usual bread everywhere on this coast, yet every part of the root from which it is made is a steady and fatal poison, of the cold kind, causing, when internally taken, violent spasms, a tumefaction of the abdomen, and a speedy cessation of all the vital functions. The aqueous part is expressed, not because it is more poisonous than the farinaceous substance, but to facilitate the baking. By the inattention of the slaves, this juice when expressed, is frequently drank by the sheep, hogs, and poultry, on the plantations, and ever proves fatal to them. Yet the animals thus poisoned are always eaten by the inhabitants. This poison, fatal as it is in its crude state, is rendered perfectly innocent and wholesome by fire. Thus the bread by baking, is rendered innoxious and nutritious; and the poisonous juice of the root, when expressed, is by the Indians and white inhabitants boiled with venison, pepper, &c., and thus affords an agreeable and salubrious soup."

The best cassava cakes are made in Jamaica. They are about the size of a cheese plate, and very thin. When steeped in oil, sprinkled with cayenne, and lightly broiled on the gridiron, they are delicious. Dressed in this manner, they form an excellent accompaniment to wine.

An inebriating drink is also made from the cassava, by the Indians. It is called *piworree.* The cassava bread is steeped in water until fermentation commences, to promote which the women chew a portion and mix it with the rest. When the fermentation is completed, the liquor is strained off, and is ready for drinking. The taste is said to bear some resemblance to that of ale, but is not *quite so agreeable;* the latter may easily be believed. An intoxicating drink, made in a similar manner from the seeds of certain plants, was met with by Captain Cook in one of the South Sea Islands.

There is a vegetable called the *Ocro*, a species of Hibiscus, which is much prized by old West Indians. The fruit is something like a small cucumber in appearance, and contains a great number of small seeds. It is sometimes boiled and eaten as a vegetable, but more frequently it is used in soup. It is slimy and mucilaginous, and not, I believe, very nutritious. It is, however, a great favourite, and when boiled down with a shin of beef and a few cocos and onions, it makes a "gruel thick and slab," such as the Creoles delight in. It was formerly much used by the female slaves, in consequence of certain properties which it was supposed to possess.

A celebrated dish amongst the early settlers in Honduras was *fingerico*, or *finger and co.* This was a large turtle cooked in the shell. When it was ready for eating, as, on account of its shape, it would not stand upon the table, unless it were propped up like a ship upon the stocks, it was placed upon a flour barrel, the head of which had been knocked in. The partakers of this savoury and delicious fare stood round the barrel, and helped themselves with their fingers from what quarter they listed, for there were various departments in this same fingerico. In one part the entrails were to be found chopped up small, and seasoned with different herbs and spices; in another a sausage meat made of the lean of the animal, also made tasty with numerous condiments; in another the blood; in another the glutinous portion of the fins; and in another the fat, green and transparent as the emerald, reposed in luscious morsels. The whole of this was covered over with browned bread crumbs, and ornamented with the yolks of boobies' eggs, red, green, and white capsicums, and in the middle was stuck the head, having in it two red bird peppers where the eyes had been, and slices of lime in the mouth. The only beverage permitted to be drunk at this "feast of shells" was champagne, which was quaffed, not from golden goblets or sparkling crystal, but rude calabashes plucked from the branches of the adjacent trees. This barbaric epicurism, the offspring of wild bush life, has gradually died away. The last cook who was skilled in the manufacture of fingericos, was an old black woman called Auntie Peggy, who had formerly been a slave. She fell a victim to the cholera, three years ago, and now there is no one left who can make a fingerico. The secret of the extraordinary lustre of Titian's blue died with him, and the art of making fingericos rests in the grave with Auntie Peggy.

A favourite breakfast diet with the creoles of British Honduras, and not by any means, I think, a disagreeable one, is *corn lob.* The name is not euphonious, but the thing signified is nutritious and wholesome. Corn lob is made of Indian corn meal and milk boiled together, until the mixture arrives at the consistency of hasty pudding, when it is eaten sometimes with salt, and sometimes with sugar, or the juice of the sugar cane. The latter is considered, and I believe justly so, to be very fattening. The negroes are very fond of the sugar cane, and if one of those gentry has nothing else to do, which frequently happens, and slumber does not assert its powerful claims, he will usually take out of his long trousers-pocket a piece of that saccharine stalk, and press the juice out of it with his elephantine tusks. The sugar cane is often given to horses, which it not only fattens, but gives to them a smooth and glossy coat.

Speaking of salt, Dr. Letheby says, "the experiments of Boussingault upon cattle have also shown how important is the function of salt in nourishing the system. He found that when cows were deprived of it they got out of condition; the hair became rough, and was matted together, bald patches appeared on their bodies, and the temperament of the animals became cold and phlegmatic." The superiority of the Jamaica salt-pond mutton has been long known. In the neighbourhood of the salt

ADDENDA

TO THE

CATALOGUE OF THE NINTH EXHIBITION OF INVENTIONS.

41. Locomotive Engine and Tender; T. R. Crampton, C.E., Buckingham-street, Adelphi.

Engines constructed upon this principle were the first to be employed for express trains in France, in 1849. Their peculiarities are the low centre of gravity, the absence of over-hanging weight, and the facility of repair, the whole of the working parts being outside. Upon the railways in the north of France, engines upon this principle have run on an average 26,000 miles per annum; whereas, the ordinary engines have only run 16,000 miles. Statistics taken over seven years, show that the wear and tear is less than in ordinary engines, and the excess of distance run is in a great measure attributed to the facility with which small repairs can be executed without removal to the workshop. Out of 22 locomotives exhibited at the Paris Exhibition, 14 were upon this principle. The only great medal awarded for locomotives in 1851, was given for this invention, and it is stated that a similar award would have been made at Paris in 1855, had not Mr. Crampton been one of the jurors.

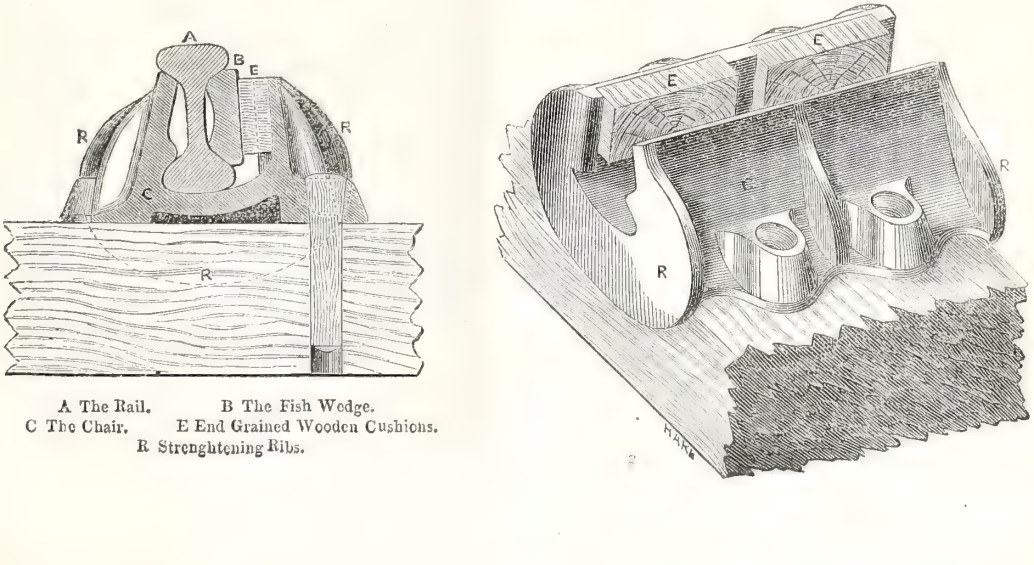
117. Patent Wedge Fish-Joint Chair and Intermediate Chair with Iron Wedge and End Grain Wooden Cushion; P. M. Parsons, 6, Duke-street, Adelphi.

The chief features in the joint chair are, that it affords the rails vertical and lateral support, while at the same time it effectually fishes the joint, and this without the use of bolts and nuts, and the consequent necessity of making holes in the rails. This is accomplished by making the fish on one side a wedge of wrought iron, which is driven in between the rails and cushions of wood placed in the chair with their end grain against it. The fish wedge is provided with jags or barbs, which house themselves in the wood cushions, and as no shrinkage in the thickness of the cushions (from the wood being placed endways of the grain) can take place, the combination affords a secure and durable fastening, and at the same time a perfect fished joint. All the parts are simple and inexpensive, and with the exception of the wooden cushions, are indestructible, and these being creosoted, and protected against the admission of moisture by the chair on one side, and the fish wedge on the other (which cover the end grain and sap vessels), are considerably more durable than ordinary wooden keys. The overhanging ribs or flanges bring the whole of the bottom of the chair into tension, and thus give great power of resistance to the strain thrown on it in driving the iron fish wedge. The intermediate chair is constructed on the same principle as the joint chair. It holds the rail much tighter than with the ordinary chair key, and keeps it firmly down on its seat. It is stated that no instance has yet occurred of a wedge shaking out, although it is upwards of two years since the first were laid down. These chairs are in use on the Great Northern, Eastern Counties, East Kent, and South Western Railways. A prize medal was awarded at the Paris Exhibition of 1855.

THE WEDGE FISH JOINT CHAIR.

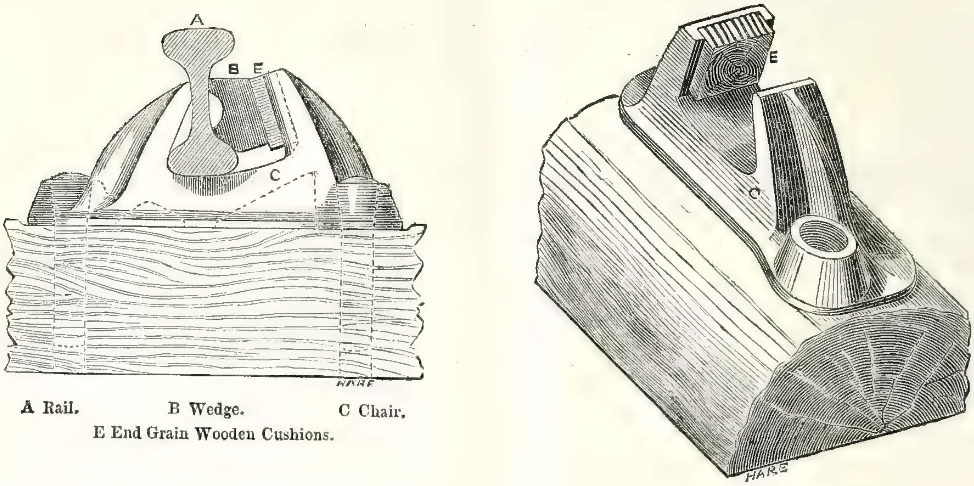
Cross Section.

Iosometrical View—the Rails and Wedge removed.



A The Rail. B The Fish Wedge.
C The Chair. E End Grained Wooden Cushions.
R Strenghtening Ribs.

INTERMEDIATE CHAIR.

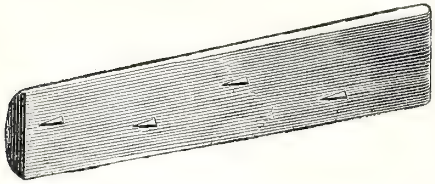


End View.

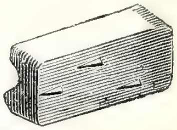
Isometrical View—Rail and Wedge removed.

A Rail. B Wedge. C Chair.
E End Grain Wooden Cushions.

The Fish Wedge, showing the jags or barbs which house themselves into the wooden cushions.



The Wedge of Intermediate Chair.



118. The Nautilus Diving Apparatus; Exhibited by the Nautilus Company, 34, Great George-street, Westminster.

This machine consists of a working chamber, capable of accommodating a large or small number of divers, and surrounded by other chambers, in which the relative proportions of air and water may be so regulated, that the divers within the machine are able to sink or raise it, or to endue it with a buoyant power for lifting weights, according to circumstances. Compressed air is supplied to the apparatus through a flexible tube connected with a reservoir at the surface. For detailed description, see *Journal of the Society of Arts*, No. 224, page 244.

119. Apparatus for Improving the Ventilation of Mines, by Removing Noxious Gases from Fast-End Workings; James Wadsworth, Hazel-grove, Stockport, Cheshire.

The great difficulty in the ventilation of mines is the dislodgement of inflammable gas from those remote parts of the workings, through which it is found impracticable to introduce an atmospheric current sufficiently powerful to prevent the accumulation of such gas in dangerous quantities. Two means of effecting this object are here shown. The first consists of a double-acting bellows, mounted upon a carriage, running upon the ordinary tram rails. This carriage also carries a supply of socket-pipes. When the machine is in use the pipes form communications between the inlet-nozzle of the bellows and the deposit of gas on the one hand, and between the discharge-nozzle and the nearest level or air-course on the other hand. The bellows being then worked, draw in the gas through the inlet-pipe and expel it through the discharge-pipe into the level, where it mingles, and is carried off with the atmospheric current maintained by the ordinary means of general ventilation. The second apparatus causes a continuous current to be maintained through pipes from the highest part of the fast-end workings, where the gas accumulates, to the air-course, by means of rarefaction produced by heat. It consists of an inner or furnace-chamber, heated by the flame of a lamp, or partly by the flame of a lamp and partly by the combustion of a portion of the inflammable air. The lamp is contained in the box which forms the bottom of the furnace-chamber, the air to support combustion being admitted through valves guarded by tissues of wire gauze. There is a third valve for the admission of inflammable gas, if desired. The lamp is furnished with a wire gauze. A second chamber, of larger dimensions, envelops the furnace-chamber, having pipes of communication with the far end of the fast-end working on the one hand, and with the air-course with the other. The heat radiated from the external surface of the inner or furnace-chamber raises the temperature of the atmosphere in the space between the shells of the two chambers. The consequent exhaustion of the inlet-pipe causes a continuous in-draught of the foul air, which passes through the outer or larger chamber, and issues from the discharge-pipe into the air-course.

119A. Patent Tin-Plate Cutting Machine, and Patent Paper and Cardboard Cutting Machine ; Stephen P. Ruggles, Boston, U.S. Exhibited by A. W. Conner, Duke-street, Adelphi.

The peculiar action of these machines consists in a rotary steel disc attached to gearing and travelling through their whole length above a horizontal steel cutter fixed to the lower framing. This framing supports the table and butt gauge. The box sliding along the upper portion of the machine, carries the steel disc and gearing, and in the handle there is a spring set up by screws at the end, to keep the cutters up to their work. In the smaller machine the drawing action of the circular cutter necessary to cut clean, and which in the larger is produced by gearing, is obtained by a piece of cat-gut passed over the brass disc in the manner of a bow drill. These machines combine the action of ordinary scissors with this advantage, that the cutting angle is always the same, and the drawing action of a knife is caused by making the disc rotate quicker than it traverses along. This is of great utility in the machines for cutting the thicker class of plates, the plates being separated by the cutters entering barely $\frac{3}{16}$ths of an inch, and so cutting with much less power and avoiding curling and burr on the edges cut. When circles are to be cut, a carrier is hung from the traversing box, pressing down the tin or other substance between the two discs by means of a cam-headed lever above, and as the bearing centre travels with the cutter, the same in feeding itself causes the sheet to turn round and cuts a circle without any previous centre-punching or scribing. Ellipses, &c., may also be produced. In the larger machines the top and bottom frames are adjusted to each other by crank or eccentric bolts at the ends so as to be set to cut different thicknesses of plate, whilst the circular cutting apparatus is detached from the traversing box, but travels in the same direction and at the same speed, thereby producing a similar result.

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144. Magneto Electric Step by Step Telegraph; Siemens and Halske. Exhibited by C. W. Siemens, John-street, Adelphi.

This instrument possesses the advantages of great simplicity, entire suppression of the battery, and capability of working through a great length of line-wire (having been worked through 3000 miles) without intermediate relays. It is intended chiefly for railway companies, and private telegraphs, requiring only one line and being always ready for work. The instrument called the Indicator consists of two permanent magnets fixed to a frame, with the opposite poles turned towards each other, between which, are placed the moveable poles of an Electro Magnet. Positive and negative currents passing in succession through the coils of the electro magnet, cause a reciprocating motion of these poles, which are therefore successively attracted by the two permanent magnets. By this motion, a needle is turned on a dial step by step, showing the different letters and signs. The electric current is produced through a second apparatus called an Indicator, which consists of several permanent steel magnets, having one common anchor made of a soft iron core, covered with insulated copper-wire, and fixed so as to revolve in two bearings. This anchor is turned by means of a wheel and pinion through the crank fixed over a dial, showing the letters and signs corresponding with the Indicator described above. By each half-revolution of the anchor, a current is produced alternately negative and positive, which passes through the coils of the Indicator, moving the needle as mentioned above. The first operation is to draw out the brass button on the side of the case at both stations, then by turning the handle one whole revolution on either station, it will give a signal on a bell attached to the Indicator. After the signals are received, the small ivory button below the dial of the Indicator is pressed inwards, and at the same time the handle turned until both the needle of the Indicator and the handle are on the blank field of the dials, when the instruments are in order for giving or receiving dispatches.

145. Portion of the Original Submarine Telegraph Cable laid down between Dover and Calais; Exhibited by T. R. Crampton, C.E., Buckingham-street, Adelphi.

This cable was taken up by Mr. Crampton during the repairs in January last, after having been submerged more than five years. It will be seen upon inspection that for all practical purposes it is equal to new, the gutta-percha being perfectly sound. This is a piece of the identical cable that first established the practicability of submarine telegraphs.

145A. Patent Arithmometer ; Thomas de Colmar. Exhibited by P. de Fontainemoreau, 4, South-street, Finsbury.

145B. Improvements in Frames of Pianofortes; John Dewrance, 33, Soho-square.

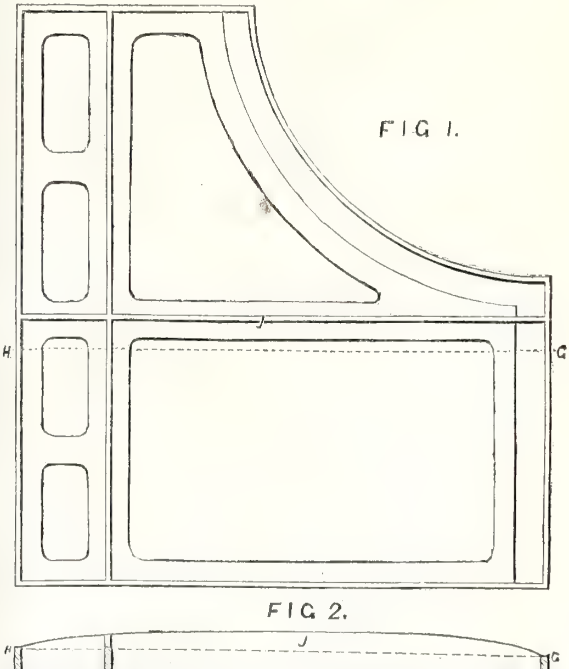
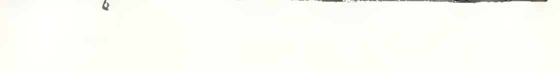


FIG 1.

FIG 2.



In this invention the improvement consists in a novel mode of constructing the frame of cast-iron. The shape of the framing must of course depend upon the particular description of instrument to which it is to be applied, and the particular section of the iron framing must also in a great measure depend upon the same circumstances, and may be varied; but in practice, the T-shaped bar has been found to answer the purpose, and therefore it is preferred to use this form. For the purpose of receiving the pins on which the strings are secured, a piece of hard wood is employed, which must be let into the frame, and fastened by bolts or screws. The surface of this piece of wood may be covered with a plate of soft metal, such as zinc or tin, so as to enable the bolts to hold the wood more securely. The sounding-board and bridge should be made of wood, and secured to the cast metal frame. Fig. 1 is a front view of one of the improved cast-iron framings; and fig. 2 is a sectional view, taken in the line H, G, of fig. 1. In this instance the strain of the strings is counteracted both in the head-beam and by the central longitudinal bar, J. A flange, *b*, is employed to support the piece of wood which receives the pins of the strings. Several forms of framing may be adopted for different kinds of instruments, the illustration showing one of the forms used. The several parts of these metal frames are cast together, and form one piece; and although cast-iron has been named as the material to be employed in making the metal frame, other metals or alloys of metals may be used with advantage for the best class of instruments.

158A. Specimens illustrative of a new process of coating cast iron and other metals with copper, &c.; L. Oudry, 2, Dunster-court, Mincing-lane.

The peculiarity of this process consists in the employment of an intermediate layer, of a gummy, resinous, or other substance, between the surface of the metal to be protected by plating and the electro deposit.

189C. Aquarium. Exhibited by Philip Palmer, 118, St. Martin's-lane.

189D. Improved Reflectors; U. Scott, 155, Grove-street, Camden-town.

These reflectors are made of sheet iron, and the surface is enamelled with glass or china.

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215. Embroidery, executed by Machinery. Exhibited by P. de Fontainemoreau, 4, South-street, Finsbury.

[N.B.—These four pages should be taken out and bound with the Catalogue.]

ponds in that island the grass becomes greatly impregnated with saline particles, and the sheep which feed upon it thrive much better than those which are depastured in other parts of the country. The flesh, from the saline quality of the food which they eat, becomes firm and juicy, and the fat in its richness approaches very much to that of venison. The sheep which are fed in the Jamaica mountains, although there are there excellent pastures, are very much inferior. The Indians in Guiana, and also in Central America, use very little salt with their food. Prescott, speaking of the Tlascalans, says, "for more than half a century they had neither cotton, nor cacao, nor salt. Indeed, their taste had been so far affected by long abstinence from these articles, that it required the lapse of several generations after the conquest to reconcile them to the use of salt at their meals." Robinson Crusoe's man Friday at first refused to eat salt to his meat, and it was a long time before he became fully reconciled to it. But Robinson Crusoe is a fiction. In one sense it is so—but there is more truth in that fiction than there is in many books professing to be authentic history. De Foe, the best and truest English prose writer we ever had, knew very well what he was about when he stated Friday's repugnance to salt. He knew most of the voyagers of his day, and doubtless he derived from them the knowledge of the manners and customs of different countries which he exhibits in his works. Salt is supposed to be a vermifuge, and I have read somewhere that there was formerly a law in a particular locality in Germany, which condemned persons who had been convicted of certain crimes to eat their food, for the remainder of their lives, without salt, and that the consequence of this privation was—that they were destroyed by worms. I strongly suspect, however, that this is a fable.

As to the different effects produced upon the human constitution by nitrogenous, or plastic food, and carboniferous, or respiratory food, and the capacity of resisting the invasions of disease which the former gives, whilst the latter leaves the system a prey to the slightest attack, there was a remarkable instance in Belize a few years ago, when the cholera visited that town. The European inhabitants, and those black and coloured people who lived on nourishing animal food, nearly all escaped, whilst the Indians, and Spaniards whose food consisted principally of vegetables, dropped to the ground one after another, as if they had been shot.

Dr. Letheby speaks of the gluttony of the Hottentots, and the large amount of food which the inhabitants of Southern Africa generally are capable of consuming. I had once an African servant who would have been a match for any Hottentot that ever lived. He was the scion of a Royal family which had fallen into trouble. An exile from the kingdom of his Royal father, he did not disdain to earn an honest livelihood by communicating to boots and shoes the blackness and polish of his shining ebon face, and conveying to knives and forks the dazzling lustre of his dark eye. He was called Prince Pindar,—the former name having been conferred upon him, no doubt, in reference to his exalted birth,—the cause of the latter I am ignorant of, unless it was his musical propensities, for he had a habit of constantly leaving off his work, putting both hands to his face, and entertaining himself with a low, confidential, melodious whistle. Be that as it may—

> " * * * Give me leave to speak him,
> And yet with charity—he was a man
> Of an unbounded stomach."

I do not know that like the famous Robbin a Bobbin he could have eaten more than three score men, or could

> "Eat the church and eat the steeple
> Eat the parson and all the people."

but he certainly possessed most magnanimous powers of mastication and digestion. On one occasion I observed him very busy with a huge bucket, and, impelled by curiosity, I examined what it contained. There were several pounds of fat pork, a large quantity of salt and fresh fish, remnants of all kinds of cold meat, scraps of bread and pie crust, two or three dozen plantains, and at least a couple of dozen of monstrous land crabs. Not black crabs, which in Jamaica are considered such dainties, but those horrid ghouls which feed and fatten in graveyards, and cheat the worm of its lawful prey. I asked him what he was going to do with that abominable mess, which he was stirring about most vigorously with the end of a paddle. He said "Me eat um massa for my break-faast." "What all that?" I said. "Hi! dat no much, me eat two time tree time dat for dinnaar." And this voracious brute was a thin, meagre looking creature, like the starved apothecary in Romeo and Juliet.

On the Belize river, about twenty miles from the town of that name, there lives a man, or did a few months ago, whose name is Jones by descent, and Richard by purchase. His longitudinal dimension entitles him to be ranked amongst the sons of Anak, for the crown of his head is at least six feet and a-half above the level of the sea. His general appearance—spare, wiry, and springy, reminds one of Cooper's "Leatherstocking," and when he walks, "long and slouching is his gait," like Peter Bell the potter. He has a massive head, covered with short, crisp, grey hair, a long aquiline nose, hollow cheeks, and a pair of enormous jaws, which open and shut like an engine, devised by some benevolent individual for the capture of unwary trespassers. This man possesses a most miraculous twist, and would have eaten spoonful for spoonful with that famous Welsh giant (from whom, perhaps, he is descended) whom John the Giant Queller, as Fielding calls him, tricked so cleverly in the matter of the hasty pudding. Report attaches some romance to the history of Mr. Jones. It is said that in his youth he met with a disappointment. He had cast an eye of tender regard upon a black but comely daughter of Ham. But the "course of true love never did run smooth," and an "oyster," we are told, "may be crossed in love." The dark fair one scorned the alliance, and declined to become his "Sweet Jenny Jones." Upon this "Poor Richard" took to his bow and his spear and has ever since been a great hunter before the Lord. But, though his heart was seared, he did not think it necessary to neglect one of the first injunctions to man; on the contrary, thinking with Benedict "that the world must be peopled," he became the father of a patriarchal progeny. Full seventy winters have now passed over his head and yet he is as active as ever, and

> "When the hounds are in the cry,
> And the deer sweeps by,"

he sallies forth with his long gun, and his longer legs, in search of savoury meat such as his soul loveth, for the appetite of this worthy man is not the least impaired, but is still as sharp and as keen as the north wind which whistles on Ben Lomond. I have heard of a gourmand, who, on seeing a hungry man make a hearty meal off a leg of mutton, expressed his astonishment and disgust that any person should waste so splendid an appetite upon such food. I have known Mr. Jones polish off, in the handsomest style, a whole shoulder of mutton,—just to wile away the time, until something more plentiful and substantial could be prepared for him. He will eat six pounds of venison steaks, and a score of plantains, as we would eat half-a-dozen oysters, to give him an appetite. When he kills a deer, he sells one leg of it, breakfasts off the other, and dines off the balance. A fearful man Mr. Jones would be to encounter in a lonely place on his return from an unsuccessful forage. The sight of his long, sharp, white teeth, glittering like a row of Turkish scimitars, and the opening and shutting of his mighty jaws, which come together with a click, like "the old oak chest which shut with a spring," would make one's flesh creep, and one's blood curdle. It would be worth while, for the sake of science, to negotiate for the purchase of his cranium, with the appurtenances, after his decease. I have no doubt that for a valuable consideration he might be induced to give a *post obit.* How far such an instrument would bind the executors and administrators, I am not prepared to say—for the head, being *personal* property, would, I presume, vest in them.

I am, &c., R. TEMPLE.

SUBMARINE OPERATIONS.

Sir,—In the Journal of your Society, of the 6th ult., I observe that Mr. John Bethell, in an address to the members at the meeting of the 4th idem, in speaking of diving dresses, stated that "he ought to mention that his diving dresses had been employed in the Bay of Navarino, in recovering guns from the Turkish ships, at a depth of 500 feet, which had been effected without difficulty, and with perfect safety to the diver." An announcement that diving could be carried on at a depth of 500 feet, was of so startling a nature, and, as I believed, so very far beyond any result attained in practice, that I have thought it right to look into the subject, and to collect some facts that might throw light upon it, and the conclusion at which I have arrived upon the evidence now before me is, that Mr. Bethell must have been misinformed as to the depth to which the divers descended in the waters of the Bay of Navarino.

I should not have troubled you with this communication had I not felt that the statement is calculated to mislead those who contemplate operations in deep water. If, indeed, works can be conducted at a depth of 500 feet, "without difficulty, and with perfect safety to the divers," many works, especially those connected with mining operations, could be effected at an enormous saving of expense, as compared with the means now in general use.

That Mr. Bethell must be in error is, in the first place, I think, proved by the fact that there is in the Bay of Navarino no greater depth than 37 fathoms, or 222 feet, and I have ascertained, by reference to the Admiralty, that the Turkish ships referred to by Mr. Bethell were sunk in 18 fathoms, or 108 feet water; and, in the second place, that the pipes used for conveying the air to the divers were made of "many folds of cloth and caoutchouc." Now, if air at a temperature of 60 deg. Faht., be compressed in a pump, so as to resist the pressure due to a column of 500 feet of water, it would, in consequence of its diminished capacity for caloric, be raised to about 340 deg. Faht., and, as caoutchouc melts at about 250 deg. Faht., it is manifest that such a depth could not be attained by pipes composed of the materials described.

I have been occupied for some years in carrying on works in deep water, and have found much difficulty in any depth exceeding 60 feet, and I am unable to find any case on record in which a man has been more than 140 feet under water (and even this I very much doubt), and on this occasion it is said to have been found impossible for him to remain even the few minutes which were necessary for effecting the object desired.

The following extract from a letter dated April 19th, 1856, from my assistant, Mr. J. Folliott Stokes, who superintended the construction of the bridge which carries the Paris and Lyons Railway over the Saone, in the City of Lyons, will be found interesting, as bearing upon this subject. This bridge is of wrought-iron, with two openings of 200 feet each, and consequently having one pier, the foundations of which are composed of cast-iron cylinders sunk under pressure to a depth of 59 feet below water, and you will observe that at this comparatively small depth very serious inconvenience was experienced by the workmen, and the india-rubber pipes and leathers of the pumps were sources of constant delays and difficulties.

"The men find that on coming out of the apparatus under a pressure of $1\frac{1}{2}$ atmospheres, they lose the use of their limbs. This lasts sometimes for an hour, sometimes for three or four days. This breaks up the gangs in a most inconvenient manner. I am inclined to think that the smallness of the air-locks causes a too sudden transition from a great pressure to a much lower one. The men working in the bell suffer very much from the heat; indeed, when the pressure exceeds that due to 50 feet of water, the heat of the compressed air is sufficient to partially melt the india-rubber pipes, and to burn the leathers of the pumps, although they were in water."

Mr. Brunel, who has sunk the large cylinder forming the foundation for the pier at Saltash-bridge, to a depth of 83 feet, let his men work but three hours at a time, and yet found them seriously affected with rheumatism and congestion of the brain, so that one of them died upon the spot.

In putting in the foundations of the two new bridges at Rochester, at a depth of 62 feet, our assistants encountered many similar difficulties, arising from the pressure even at that depth.

To my mind it appears very necessary to advise the greatest caution in trying to execute works at the depth of even 100 feet, and is it not possible that when Mr. Bethell's friends, the "Greek merchants," from whom he says he got his information as to the divers in the Bay of Navarino, gave the depth to which they descended as 500 feet, they may have made a mistake in the first figure, and that the real depth was 100 feet and not 500?

I subjoin copies of some correspondence with Mr. Bethell on this subject, and

I am, &c.,
CHARLES FOX.

Spring Gardens, April 8, 1857.

Spring-gardens, March 23rd., 1857.

Dear Sir,—At the Society of Arts on the 4th. inst., you spoke of some case in which a diver had been 500 feet under water.

I am anxious to get the facts of so interesting a case, having just now a work of difficulty arising from great depth, and I shall therefore feel obliged by your telling me anything you may know of the circumstance you named.

Yours faithfully
C. FOX.

John Bethell, Esq., 8, Parliament-street.

8, Parliament-street, Westminster, March 25th, 1857.

My Dear Sir Charles,—I should have answered your note before, but I was at Birmingham till yesterday.

The deep diving I alluded to was in the Bay of Navarino, on the wrecks of the Turkish fleet sunk there, but as I got my information from the Greek merchants who sent out the apparatus, I cannot warrant the depth so great as stated.

But if the air pipes and pumps are strong enough, I should not be afraid of working in that depth. If the man is kept fully supplied with air of the same density as the water that surrounds his body he would be quite safe.

Yours faithfully
J. BETHELL.

Spring Gardens, March 28th, 1857.

Dear Sir,—I am obliged by your note of the 25th instant, and must apologise for again troubling you; but the subject is one of so much importance that I shall feel much obliged by your establishing the fact mentioned by you at the Society of Arts, on the 4th instant, and which is reported in the Journal of that Society on the 6th instant, in these words:—"He (Mr. Bethell) ought to mention that his diving dresses had been employed in the Bay of Navarino, in recovering guns from the Turkish ships, at a depth of 500 feet, which had been effected without difficulty and with perfect safety to the diver."

The depth of 500 feet is so far beyond anything I have heard of, or any case I can find on record, that I naturally feel much interest in obtaining all the facts.

Of what material would you construct the pipes for conveying air to such a depth?—Yours, faithfully,

C. FOX.

8, Parliament-street, Westminster, 1st April, 1857.

Dear Sir Charles,—I have not been able to trace the man who told me about the use of my diving apparatus at Navarino. I cannot find out where he is now, but there must have been some mistake, as I find that the apparatus I sent out would have worked securely in 300 feet water, and an apparatus fit for working in 300 feet I could now supply.

The pipes were half-inch in diameter, and made of many folds of cloth and caoutchouc, very strong and fit to resist an internal pressure of 150lb. to the square inch.

I perceive that the plan about to be used by the Americans for raising the Russian ships at Sebastopol, is the same as I patented in 1835. Yours faithfully,

JOHN BETHELL.

NATURE PRINTING.

Sir,—I must beg to intrude a few remarks further on the subject of Mr. Dresser's New System of Nature Printing. In his reply to my observations upon his paper last Wednesday week, he reiterates emphatically the nature of his claim, viz., that of printing from the leaf on stone and metallic surfaces, and so enabling the impressions to be multiplied at pleasure. Now, in the first place, Mr. Dresser has been over and over again superseded in his idea of transferring such objects to such surfaces. And, in the second place, Mr. Dresser should be well aware that he cannot practicably carry out that which he advances as his claim. Mr. Dresser must know full well that, with regard to metallic surfaces especially, his idea is a mere toy-process. He cannot obtain—and I say it with confidence—by such modes as he adopts, a printing surface from which impressions can be printed in a practical manner. With respect to his producing—experimentally, even—impressions of such objects with all their natural excellence, it is a mere matter of words. He does not do it—and he cannot do it.

If Mr. Dresser had paid due attention to my paper upon the subject, he would have remembered that I expressly stated that so-called Nature Printing had its limits, and that care would be required to confine its process within its capabilities. That its capabilities —as practised by the Imperial Printing-office at Vienna, and afterwards by myself—are of a practical nature, there can be no doubt, and the most eminent botanists of the present day have expressed most favourable opinions—provided a proper choice of subjects is made. If the *Hortus siccus* be valuable, the possible and practicable results of Nature Printing (by the Austrian mode) must be doubly so, for its product yields even more than is observable in the *Hortus siccus* itself.

Were Mr. Dresser a practical man, he would have known that the present mode of Nature Printing is the combined result of a multitude of experiments, spreading over a long space of time, and made by an infinite number of hands. However he may please himself with his isolated process, I would beg to inform him, that among the number of previous experiments his own was taken up and rejected. I, myself, with the best possible appliances up to the present time at my command, have tried over and over again to establish both lithographic and typographic processes in connection with the art, but certain requirements for successful and practical results interposed—such requirements being as essential to Mr. Dresser's own experiments for success as to my own. That improvements will ultimately be effected over the Austrian process is certain—but they will emanate from quite a different mode of operation.

Whilst upon the question, I will just enumerate, for the better comprehension of the general reader, results already effected by the Austrian mode. For the short time that the process has been in operation they are somewhat remarkable. Austria has produced three practical results—Henfler's *Mosses*,[*] Ettinghausen and Pokoring's *Flora of Austria*,[*] and Frauenfeld's *Seaweeds*;[†] while, with regard to our own country, *The British Ferns*[‡] have been successfully carried through the press; and already are prepared for publication *The Exotic Ferns*, *The British Mosses*, *The British Seaweeds*, and *The British Lichens*.

It remains for Mr. Dresser to produce works of such a class, and upon such a scale, by the means that he advances. I am, &c.,

HENRY BRADBURY.

Whitefriars, April 3rd, 1857.

ART TREASURES EXHIBITION.

Sir,—As the time for opening the Exhibition of Art-Treasures at Manchester is approaching, permit me, through the medium of your *Journal*, to suggest to the managers the propriety of admitting thereto at a reduced charge—say half-price—the members of the Mechanics' and similar Institutions throughout the kingdom, or at least of those in the vicinity of Manchester. Such a boon would, I believe, be highly appreciated by all to whom it might be extended, and would be productive of much good feeling. The concession, however small, would, moreover, tend to allure some who might not otherwise be disposed to visit the Exhibition, and thus the managers would sustain little or no pecuniary loss by this graceful act of liberality. I am, &c.,

E. B.

Hanley, Staffordshire.

Proceedings of Institutions.

Pimlico.—At the Literary, Scientific, and Mechanics' Institution on Monday, the 30th ult., Mr. E. G. Holland, an American gentleman, gave an interesting lecture on "The Romance Writers of the New World." Mr. Holland said that America was not only the country of a varied material enterprise, but of a new and vigorous literature; that the national motto of "going a-head," had evidently now a place in its literature; that it must henceforth abound with the same creativeness, perseverance, and energy, that have hitherto been displayed in other pursuits. The lecturer then spoke of the romance, or story, as the most captivating and successful method of teaching; that the novelist reflects human life both as it is, and as it ought to be. He then spoke of James Fenimore Cooper, as the Columbus, or first explorer of American romance; the first to use those threefold materials of interest, the magnificent scenes of nature, the wild life and poetic legends of the aboriginal races, and the amusements and modes of life common to the early white settlements in his own great state, the state of New York. The lecturer then examined his numerous works, saying that it was the "Spy" that created his fame and made him known to the world; that the "Pioneers," "The Last of the Mohicans," "Pilot," "Prairie," "Red Rover," "Pathfinder," and "Two Admirals," may be taken as his best productions; that Cooper was a man of great decision, strong personal courage, thorough honesty, and seriousness of purpose. Mr. Holland then spoke of Washington Irving, of Longfellow, Nathaniel Hawthorne, and Mrs. Stowe, analyzing their works and discriminating the peculiarities of genius in each. The lecture contained analysis, biography, and illustration, in a manner to impart the greatest amount of instruction and amusement, of which the subject is capable. At the conclusion a vote of thanks to the lecturer was moved by the chairman and carried unanimously.

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[*] "Specimen Floræ Cryptogamæ Vallis Arpasch Carpatal Fransibrani:" Conscripsit Ludovicus Eques de Henfler. Seven folio plates. Vienna, 1853.

[*] "Physiotypia Plantarum Austriacarum: Mit besonderer Berüchsichtigunz der Nervation in den Flächendrganen der Pflanzen." Von Professoren Dr. Constanten von Ettinghausen und Dr. Alois Pokorny. 500 folio plates. Vienna, 1856.

[†] "Die Algen der Dalmatischen Küste mit hinzufugung der von Kützing im Adriatischen Meere Überhaupt Aufgefuhrten Arten." Von George Frauenfeld. Twenty-four quarto plates. Vienna, 1855.

[‡] "The Ferns of Great Britain and Ireland." By Thomas Moore, F.L.S. Edited by John Lindley, Ph.D., F.R.S. Imperial folio. Fifty-one plates. London, 1853.

MEETINGS FOR THE ENSUING WEEK.

Tues. Syro-Egyptian, 7½. Mr. Samuel Sharpe, "On the Identification of the Egyptian and other Towns mentioned in the Bible."
Med. and Chirurg., 8½.
Wed. Society of Arts, 8. Mr. J. W. Papworth, "On Houses as they were, are, and ought to be."
Ethnological, 8½.
Sat. Asiatic, 2.
Medical, 8.

PATENT LAW AMENDMENT ACT.

APPLICATIONS FOR PATENTS AND PROTECTION ALLOWED.

[*From Gazette, April* 3*rd*, 1857.]

Dated 20*th December*, 1856.

017. Edward Loos, 30, Leicester-square—Improvements in the manufacture of cement, mortar, concrete, and artificial stone.

Dated 22*nd December*, 1856.

3031. Thomas Roberts and John Daniell Pritchard, Warrington—Improvements in the manufacture of oxalate of soda, which improvements are also applicable to the manufacture of oxalic acid.

Dated 27*th February*, 1857.

579. William Henry Thornthwaite, 121, 122, and 123, Newgate-street—Certain improvements in barometers.

Dated 4*th March*, 1857.

632. Thomas Brown, Fenchurch-street—Improvements in capstans.

Dated 5*th March*, 1857.

646. Anthony Ansens, Paris—Improvements in moulds or forms for loaves of sugar.

648. John Woodley and Henry Herbert Swinford—Improvements in sawing machines.

652. William Edward Newton, 66, Chancery-lane—An improved manufacture of tracing cloth. (A communication.)

Dated 19*th March*, 1857.

769. Joel Williams, Mold, Flint—Improvements in cocks or taps.

771. Samuel Campbell, Newington, Surrey—Improvements in preserving vegetable substances.

773. William Reid, Shettleston, Lanark, N.B.—Improvements in safety apparatus for guarding the mouths of pits, excavations, and other openings.

775. William Gwillim Merrett, 49, Leadenhall-street—An improvement in coats and waistcoats.

Dated 20*th March*. 1857.

777. Jean Ninck, 37, Brewer-street, Golden-square—Improvements in placing sets, or partial sets, of teeth, gums, and palates on plates.

779. Henry Hall, Spotland, Rochdale, Lancashire—An addition to "throstles" for doffing the bobbins.

781. Charles Weiss and Henry Listef, Huddersfield—Improvements in the means, machinery, or apparatus employed in the finishing of mohair and other textile fabrics.

783. John Parker, East Markham, near Tuxford, Nottingham—Improvements in apparatus for separating corn and other grain and seeds from dust, chaff, and other matters.

785. John P. Jourda, New York—Raising sunken vessels.

787. George William Sayer, Cognac, France—Improved machinery for stopping or retarding railway carriages.

789. William Johnson, 47, Lincoln's-inn-fields—Improvements in steam boilers and furnaces, and in apparatus connected therewith. (A communication.)

Dated 21*st March*, 1857.

793. William Banks and John Banks, Bolton—Certain improvements in machinery or apparatus to be employed for washing, scouring, or bleaching cotton, linen, and other textile fabrics.

795. George Perrott, Cork—Improvements in horse gearing.

797. Richard Archibald Brooman, 166, Fleet-street—An improved method of driving the spindles of spinning frames. (A communication.)

799. James Edward Cole, New York, U.S.—Improvements in the rig and working the sails of square sail vessels.

801. Robert Mushet, Coleford, Gloucester—Improvements in the manufacture of cast steel.

803. Frederick Shand Hemming, Westminster—Improvements in the mode of treating peat, mixed or not mixed with other vegetable or animal fibrous substances, and in the application of the same to various purposes.

805. Thomas Howard Head and Joseph Wright, Teesdale Iron Works, Stockton-on-Tees—Improvements in casting railway chairs, and in the manufacture of other castings.

807. Henry Dolby and Edwin Thomas Dolby, 56, Regent-street—Improvements in machinery used when printing several colours in succession on the same surface.

Dated 23*rd March*, 1857.

809. William Heap, Ashton-under-Lyne—Certain improvements in self-acting slide lathes.

811. John Sherar, Aberdeen—Improvements in oil and spirit lamps for the formation of burners obviating shadow.

813. William Mills, Lower Craven-place, Kentish-town—Improvements in the action of upright pianofortes.

815. Thomas Mosdell Smith, Hammersmith, and Cornelius Burke, 27, Earl street, Kensington—Improvements in the preparation of materials applicable to the manufacture of candles.

817. Frederick John Jones, Aldermanbury—An improved buckle or fastening.

Dated 24*th March*, 1857.

819. Robert Hanham Collyer, M.D., 3, Park-road, Regent's-park—Improved machine for cleaning and purifying wheat and other grain.

821. Jean Alexandre Zibelin, Paris—Improvements in the fabrication of artificial wines, brandy, and vinegar.

823. Alfred Vincent Newton, 66, Chancery-lane—Improvements in carding engines. (A communication.)

825. Thomas Lawes, 77, Chancery-lane—An improved construction of agricultural implements to be used in tilling the land.

Dated 25*th March*, 1857.

827. William Henry Collins, Birmingham—Improvements in attaching knobs to spindles.

829. John Mickle, Newcastle-upon-Tyne—Improvements in machinery or apparatus for reaping and mowing.

831. John Hewett, Sheffield—Improvements in sewing machines. (A communication.)

833. Alfred Vincent Newton, 66, Chancery-lane—An improved construction of water meter. (A communication.)

835. John Henderson, Lasswade, Mid-Lothian, N.B.—Improvements in writing instruments.

837. William Somervail, Dunlop, Ayr, N.B.—Improvements in the treatment or preparation of fibrous materials for being spun.

839. Charles Cowper, 20, Southampton-buildings, Chancery-lane—Improvements in the manufacture of shot and shells for rifled ordnance. (A communication.)

841. Joseph William Wilson, Banbury—Improvements in the cutting tools used for rounding, surfacing, or otherwise operating on wood.

INVENTIONS WITH COMPLETE SPECIFICATIONS FILED.

860. George Gilmour, Massachusetts, U.S.—A new and useful contrivance or mechanism for shackling or attaching another anchor to the chain of an anchor to which a vessel may be riding, his said invention being termed by him a "second anchor shackle."—27th March, 1857.

833. Antoine Joseph Quinche, Paris—Improvements in apparatus for counting, registering, and indicating the distance travelled by vehicles.—31st March, 1857.

WEEKLY LIST OF PATENTS SEALED.

April 3rd.

2316. John Hall, junr.
2323. James Allen.
2340. Oglethorpe Wakelin Barratt.
2342. Smith Bottomley and James William Crossley.
2346. Joseph Bunnett.
2351. James Chiesso.
2357. Thomas Dugdale, junr.
2436. John Smith.
2445. Joseph George.
2464. Charles Briqueler.
2492. John Walley.
2764. Samuel Russell.
64. Julius Goodman, Abraham Myers, and Louis Goodman.
71. Thomas Ball and John Wilkins.
114. Sir James Murray, Knt. and M.D.
148. Robert Reeves and John Reeves.
157. Edwin Clark.
159. Edwin Clark.
175. Henry Chamberlin, junr.
193. John Rubery.
194. Gustave Perez di Termini.
221. Henry Bessemer.
259. Henry Chamberlin, junr.
353. John Henry Johnson.
364. William Wilkens.

April 7th.

2354. William Bradford.
2356. Daniel Foxwell.
2364. Thomas King.
2370. John Shaw and Edwin Shaw.
2372. James Saul Hendy.
2375. Christopher Richard Norris Palmer.
2379. John Mc Innes.
2392. George Elliot.
2394. William and Jacob Todd.
2398. John Roscow.
2432. George Morton.
2451. Sir Francis Chas. Knowles.
2617. Rd. Archibald Brooman.
2751. Rd. Archibald Brooman.
3080. Thomas Wilks Lord.
232. Edward Highton.

Patents on which the Stamp Duty of £50 has been Paid.

March 30th.

742. William Edward Newton.
743. Alfred Vincent Newton.
827. John Platt.

March 31st.

757. Thomas Scott.
771. Bernhard Samuelson.
786. George Francis Wilson and James Monroe Whiting.

April 1st.

758. James Forsyth.
762. William Gossage.
781. William Edward Newton.
868. Giuseppe Devincenzi.

April 2nd.

796. Emile Dupont.

April 3rd.

766. James Higgin.
792. Joseph Nash.
800. Julian Bernard.
802. John Henry Johnson.
818. John Henry Johnson.

April 4th.

782. James Howden.
789. James Smith.
801. James Worrall, junr.

Journal of the Society of Arts.

FRIDAY, APRIL 17, 1857.

NOTICE TO CANDIDATES.

Persons who intend to offer themselves as Candidates at the Society's Examinations in June next, in London and at Huddersfield, are desired to take notice that no one will be admitted to the Examinations who shall not have sent in his "Return paper" to the Secretary of the Society of Arts, before Monday next, the 20th inst.

Forms of the "Return paper" may be had on application to the Secretary of the Society of Arts.

EXHIBITION OF INVENTIONS.

The Society's Ninth Annual Exhibition of Inventions was opened on Monday, the 23rd ult. The Exhibition will be open every day till the 23rd of May, from 10 a.m. to 4 p.m., and is free to the members and their friends. Members, by tickets or by written order bearing their signature, may admit any number of friends.

ART TREASURES EXHIBITION.

The Council of the Society of Arts have appointed a Committee to make arrangements for organizing a visit of the members to the Art Treasures Exhibition at Manchester.

EIGHTEENTH ORDINARY MEETING.

Wednesday, April 15, 1857.

The Eighteenth Ordinary Meeting of the One Hundred and Third Session was held on Wednesday, the 15th inst., Edwin Chadwick, Esq., C.B., in the chair.

The following Candidates were balloted for and duly elected members of the Society:—

Aird, Charles.
Blake, Rev. William.
Greenwood, Thomas.
Hall, Samuel Carter.
Kinder, Arthur.
Nash, Frederick John.
Newton, Frederick.

The following Institutions have been taken into Union since the last announcement:—

434. Derby Working Men's Association.
435. Portland Breakwater Mechanics' Institution.
436. Lewes Improvement Association.
437. Portsea Athenæum and Mechanics' Institution.

The following Colonial Institution has been taken into Union since the last announcement:—

Toronto Mechanics' Institution.

The paper read was:—

ON HOUSES AS THEY WERE, AS THEY ARE, AND AS THEY OUGHT TO BE,

By John W. Papworth, F.R.I.B.A.

A Society that for a hundred years has applied itself to the encouragement of the judicious application of capital in arts, manufactures, and commerce, needs no apology for considering a few of the results of the employment of capital on some buildings and in some building operations; that is to say, for considering the durability, convenience, and beauty, the cost, profit, and value, which some of our buildings, especially dwellings, at present afford under competition and insufficient education. Any one of these subjects offers materials for an evening's discussion, and, therefore, short explanations and descriptions only can be given; facts and figures must be taken as proved; and there will only be three definitions which must be borne in mind, viz., of the building owner, the architect, and the builder.

A building owner, is a private person, who invests his money in a building as a speculation, and who generally knows nothing of the construction and cost of the building. A person who invests his money in a matter of which he knows nothing, with not any guarantee as to the stability of the undertaking, and no information as to the character of the man with whom he is to entrust that money, is one of the most lamentably ill-educated people that the inquiries of this Society can discover; yet such is the case with a large proportion of those who either rent, buy, or pay for building any edifice of any sort.

An architect is a person whose business it is to know in his mind the building thoroughly which he has to design before it exists; to proportion the number and sizes of the rooms and their parts to their uses; to arrange them in a convenient manner; to give beauty to those parts and their details; and to place these graceful portions in good relative positions as to the inside and outside of the building; to foresee all the essentials required by custom, health, law, locality, materials, site, &c., especially by the intention and prescribed expense of the building; to choose amongst the various methods of sound construction; and to be so reputable that his decision as to the meaning of contracts and the quality of the materials and labour employed in that construction shall be binding upon the building owner and the builder.

A builder is a person whose business it is to provide, in the cheapest market, good labour and good materials, and to supply them and their results to the building owner at a reasonable profit, according to the directions in the drawings and specifications by which the architect expresses his decisions; this, and this only, is the legitimate province of the builder; who is or professes to be, bricklayer, mason, carpenter, smith, plumber, joiner, plasterer, painter, &c., all in one. Our epoch of *the division of labour* has seen all the trades connected, however remotely, with building combined in single hands, to the loss of all concerned except the capitalist; the good work of the present day is the bad work of fifty years ago.

The merchant knows what to expect, who orders an agent to make up an examined cargo of goods suitable to a particular market, which goods are to be furnished by a warehouse that does not keep many of them in stock, and has to manufacture, or get manufactured all the rest to order. This is the relation of the building owner, the architect, and the builder.

The merchant does *not* know what to expect, who orders that a cargo of goods suitable for a particular market should be shipped without examination from such and such a warehouse; the goods may be very good, but prohibited in the port they are sent to, or they may be legal, and of such a quality as not to pay for freight. This is the relation of the building owner and the builder, without the intervention of the architect.

The preparation of this paper has been caused by the fact that in my professional education and practice, during both which you have several times honoured me by your favourable attention, it has been my habit to examine, value, and repair buildings at their birth, prime, and decay; thus I have seen that old houses survive generations of new ones; that new houses are generally ugly; and when pretty are frequently not worth in the market what they cost.

The *Times* has called upon its readers to compare old London-bridge, faulty enough in design, but living for six hundred years, with Westminster-bridge, 1750, and Blackfriars-bridge, 1760, both now supported on crutches. The first of them is waiting to be swept away as a nuisance some day; the other may remain an invalid until the crutches rot and the fabric falls under the weight of a man, a horse, and an empty cart. This weight is fixed as the fatal one, because it has once been enough to break down a railway-bridge. There was no deodand, I believe, on the human body, but the cost of the other animal and the cart must have been paid by somebody.

The same comparison may be made with regard to houses. A work by the late Mr. Hudson Turner, which is still new, and called "Some Account of Domestic Architecture," is filled with descriptions of houses built at the same time as Old London Bridge, or earlier, and of houses built from that time to the year 1500, which are still standing. We need not recapitulate his list, but, acknowledging the beauty of nearly all his examples, we will take up the subject at the beginning of the sixteenth century, when brick was a fashionable material.

We shall find that a large number of the timber and of the brick houses that were built between 1509 and 1649, still remain, and command what may be termed a fancy price. There is actually no saying when they will perish; some in ruins like Tattershall are as good as many a new house of the present day. If we visit London just on the skirts of the great fire, we see houses that need not be pulled down, which is more than can be said of the London that has been built since 1800. To say nothing of almshouses dating between 1550-1650, we shall find that houses built before 1600 in the Strand, Little Moorfields, Cross-street, (Islington), Holywell-street, Gray's-inn-lane, Bishopsgate-street, were, till lately, or are now, existing. These are certainly not in very good condition, but we shall find houses 1620-30 in Lincoln's-inn-fields and Great Queen-street, 1637 in Chandos-street, Covent-garden, 1640-62 in Clare-market; 1657 in Middle Temple-lane, and 1660 in Hatton-garden.

Keeping generally westward with fashion we find 1678 King's Bench Walk, Essex-court, and Farrar's-buildings in the Temple, Arundel-street, Exeter-street, and Sackville-street, 1680 the Old Jewry, King-street, St. James's, Crown-street, Wardour-street, and Soho-square; Paper-buildings in the Temple, which Bagford says were so called from the slightness of their construction, 1685, were not rebuilt till 1848. So that actually houses built in what was then considered a slight manner, have lasted 160 years; indeed, it was lately stated at an inquest that a house was only 200 years old, and therefore could not have been supposed to be in danger; in fact, ought not to have fallen. This is a remarkable proof of the extreme difference between the old and the new houses; if we reflect that a glance through the journals of the last fifteen years will show the fall of about as many houses before they were finished, as of the old houses. Yet Neve, in 1703, says, "the greatest objection against London houses (being for the most part brick) is their slightness, occasioned by the fines (*or ground rents*) exacted by the landlords, so that few houses, at the common rate of building, last longer than the ground lease, *i.e.*, about 50 or 60 years, and this way of building is very beneficial to trades relating to it, for they never want work in so great a city, where houses are always repairing or building." And probably much of his observations applied only to houses on the outskirts of the then city, for we find that about that time good houses were built, as 1700 Red Lion-square, Bolton-street, Devonshire-street Queen-square, and Great Smith-street; 1707-8 King-street Golden-square, Queen-square Westminster, and Great Ormond-street; 1716 New Bond-street, Conduit-street, and Hanover-square; 1718 Rathbone-place; 1720, Bedford-row; before 1725, King-street Covent-garden; 1727, May Fair; 1730, Oxford-market, Half Moon-street, and South Audley-street; and 1737, Crown Office-row, in the Temple.

The age of these houses is clearly marked by the fact, that after 1708 the window sashes in London and Westminster were placed in reveals by order of a Building Act; fifty years afterwards a new Building Act was necessary from the great increase of buildings, and the order for reveals extended to some outlying parishes; in 1766, Parliament again met the great increase of buildings by a new act; and in 1774, came the stringent act called the Black Act.

About 1765, Berners-street and Grosvenor-place; 1770, Great Russell-street and Salisbury-street; 1775, Mansfield-street and Stratford-place; 1778, Portman-square, Portland-place, and the Adelphi were built. Many of these streets built 1760-1780, under vigorous legislation, and leases for 90 years, have houses that although old-fashioned, are handsome, convenient, and far too good to be pulled down. The very foundations of this Society's house are shown to foreigners, though perhaps few of my audience know that such a sight exists; except to those engaged in building it is an unpleasant and useless visit.

But with the year 1790, we have Lisle-street; 1795, the New-road; 1800, Alfred-place Gower-street, and Baker-street; 1805, Great Surrey-street, Wade-street, and Russell-square; 1810, Bryanston-square; 1815, Park-crescent; 1820, Regents-park, Burton-crescent, and Regent-street, or their neighbourhoods. Regent-street rubbish was a term well understood by the workmen employed on it, and Regent-street rubbish, for a great wonder, it remains. I counted upwards of 30 cracks in one wall of a house there. But bad as that is, it is not really so bad as much that has been since built,—it stands.

The public would seem to have a belief that a low rent and a good house, in a good situation, are likely to be put before it under the present system of competition. When the landlord was the builder, and covered four or five acres with houses, it was his interest to build all equally well—he could get his rent—but when he let that ground to four or more builders, they cut down the cost of construction, in order to compete with each other for profit out of the rents, which their own competition made lower than their landlord would have asked, and this system of competition is part of the secret of our present bad houses. The other part of the secret is the folly of people in renting or buying anything in the shape of a house, without knowing, or endeavouring to know, anything about it; yet the public will not hire or buy a piano in the same way.

The usual way of starting a street is to let the land to that anomalous being, a speculative builder. He need not be a builder, or a tradesman in any branch of building—indeed the persons whom I have known succeed best, were a sailor, who had succeeded to some property, and built two houses for £7,000, which he sold immediately, in the most careless, openhanded way, for as much each—a chandler's shopkeeper, who built a row of forty houses for £300 each, and sold nearly all of them, but none for less than £600—and a footman, who built a street in such a style that at last the tradesmen actually refused to work any longer for him, but who complacently said, in the court of law to which he summoned them, tenants would occupy anything he put up.

Between 1760 and 1810 many streets were built on a system which no longer prevails; it was called blood for blood; because if a plumber took a piece of ground, he arranged with a bricklayer, carpenter, joiner, and painter to put their work over the ground, each taking one or more houses finished with his plumbing in payment.

Of course his lead was thin; the brickwork was poor; the rafters and joists were weak; and the glass and painting discreditable.

From 1800 to 1825 there was a different system; builders who gave themselves up to the business of building streets on speculation, borrowed of their friends and tradesmen, and paid their debts according to the sale of their houses; this system dropped when the lenders found unfinished houses left on their hands. Since 1815 the timber merchants, &c., have lent money to the speculative builders, and of course the quality of the materials they supplied could not be disputed; but these persons, especially the timber merchants, have apparently had reason to suspect collusion between speculative builders and ground landlords; and are now more wary; indeed, the real speculator is often the landlord who lets ground and advances money, in the hope that the speculative builders would put a good deal more money of their own or other peoples in the shape of carcasses on his ground, and by failing would allow him as mortgagee to foreclose and get, at a cheap rate, carcasses to be finished scampishly and sold at an apparently reasonable price.

We see houses built before 1700, actually still too good to be pulled down when 170 years old, and most of them are considered good for another 40 years at least; we see many houses only intended to last for 100 years, new fronted, and these also are considered good for at least another 40 years; and we see many houses that were built before 1800, that are now being tinkered in order to last that time. But we also see whole quarters of London consisting of houses built since 1790, which the tenants quit from absolute fear; rows exist where the representatives of the builders would be too happy to get rid of their prospective burdens, and sell their interest or rather burdens in their leases, for a mere song.

Why our dwelling houses in London are built after one plan, viz., an entrance passage, a front room, a smaller back room, and a staircase by its side, is a mystery to many besides myself. The plan is no doubt a very good and healthy one, where it provides a thorough draft every time the back or front door is opened, but it has a great tendency to make the chimnies smoke, and to keep the house very cool in winter. Why, also, the kitchens should be placed in the basement is not clear; the open doors in summer carry all sorts of scents up the stairs. Indeed, in this respect the very small houses, like those in Camden-town, which have no basements, but have kitchens in the yard, might be usefully followed in larger houses, and the servants' rooms might be above each other at the back of the house, and all the way up. Some good third-rate houses have the staircase in front, and gain a handsome back room, at little expense to that in front, but this plan is rarely followed. It is also curious that speculative builders never will put a ventilator to the top of the staircase, and so the whole heated and damaged atmosphere of the house is poured into the top rooms, which also happen to be the apartments for the invalid and the nursery.

There is hardly a house fit for an invalid in London, yet almost every second house in a street contains, on an average, one invalid in a year, and all the year round. Perhaps this is one reason why so many invalids live abroad, where all their home is on one floor, and where there is only one staircase, and that a very easy one to descend, in order to get into the garden or the street. Back Houses, too, are quite gone out of fashion, as if our families had nothing to do but to sit at the front windows to see the passing vehicles. I was much struck, in several of the Belgian and French towns, with the system—of which traces may still be seen in the city, viz.,—of having a carriage entrance, in which a porter lives that stops all incomers to know their business. He and his wife act as servants, on occasion, to the inmates of the front and back houses. Through the carriage entrance I passed into a pretty, though small, garden, (I should say that no carriage except for an invalid entered,) which separated the front and back dwellings. In compliance with continental customs most of these were large enough to have a family or two on each floor, but I visited where only one family occupied the pretty little house. There the porter is answerable for your house; you put the key on your hook in his lodge, and the whole family can leave for the best part of a summer's day, week, or month, with safety. The convenience of this system to men living in chambers in London is so obvious, that it is surprising that families have not adopted it. The cost of one servant is at least saved, and nearly one-half of another is quite saved. The dust and noise of the streets does not affect the back house, and by letting the front one for business, the rental of the ground is much increased. There ought to be a stop put to the barbarous system of using basement floors as sleeping rooms, and for ovens. There is no occasion for the great part of our bread to be prepared in underground holes, where the baker's men can see nothing except by candlelight, and which are subject to all the dirt and effluvia—but I need say no more on that point. In the best houses in certain parts of London, the female servants are made to sleep in the basement. It was my business to survey a house near Russell-square the other day, and I found under the entrance passage, with a window looking (it would not open) into the enclosed shed under the steps, and a chimney place blocked up, a closet in which two servants were said to sleep. The fœtid odour was such as the mistress of the house apparently thought accidental, and she was good enough to explain to me that it arose, she thought, from the fact that her neighbour's cistern always kept overflowing and made one side of this little bed-room rather damp, so damp indeed that the plastering could not be said to stand upon the wall. To find sink-stones with the holes corked up is nothing new at home. Perhaps one of the greatest improvements in London houses of all sizes, would be to have the drains laid so near the surface, and so covered by boards in their line, that they could be examined or cleaned without trouble; at present there is nothing which embarrasses me so much on surveying a house. If the floors are taken up and the drains are clear, there is great wrath at the trouble and expense; if reliance is placed on the assertion that the drains are clean, it by no means follows that they are either clear or sound, and many a drain has been allowed to leak its contents away into the kitchen floor and the foundations, from which cause alone there are many damp walls in London.

I shall say nothing about a backwardness in adopting patent sash-fastenings, calculated to render the labour of cleaning the windows less dangerous; or sensible designs for stove grates; or speaking tubes; or ventilating glass in the windows; or self-fitting lock handles; or small rooms fitted up for a bath or baths, where children might upset the bath without injury to the house as is frequently provided abroad, especially in the north of Europe; or the possibility of making a house so nearly fireproof, even if it be an old one, that lives should not be lost in case of fire; or of better shutters, than the ugly contrivances now in use; or of lifts, or of several other things equally useful and valuable; yet these are all matters which are neglected in our houses, of the common as well as of the better sort; and I am inclined to think that it is because an architect is not employed. Perhaps we might go further, and say that if an architect is said to be of no use except to increase the cost of a house by the amount of his commission, at all events an amateur, or a speculative builder would certainly be sure to do better. You know that the new streets of London are filled with houses that have little or no real convenience in them, and that the speculative builder does not seem to care a jot for the sanitary and social improvements of the day; but you probably do not know the sort of faults committed by those men who, loftily saying, "we can do without an architect," think themselves clever enough to direct their tradesmen. Houses without staircases, as in Harcourt-street, Dublin; without a front door, as at a house in Liverpool; without a door to the drawing-room, on which occasion my father was called in by a client who became my godfather; without light to the stairs, which is common; or virtually cut in half, as by a military engineer, are absurdities seldom believed but oftener perpetrated.

As to competition, the matter is still worse. The public decides that it wants a cottage, a shop, a house, a school, a parsonage, or other buildings, of which it fixes the price. On what grounds it fixes that price nobody can say; yet the public, knowing nothing of the price of a building, appoints a committee to spend this sum in a satisfactory building: whether the committee, or a private person, wants the house, &c., the following steps are the same. A child who has to choose between a large plain cake and a small pretty cake, would ask if they were equally good; but the public expects to have its cake the biggest and prettiest at the same time without security as to whether it is good at all. So it advertises a competition.

Where a lawyer, a medical man, or a broker, is wanted, the public can be tolerably safe in seeing if the name is on the rolls or lists of the respective bodies corporate, but, when the public requires the services of an architect, it accepts as one any person who chooses to take the title. Of course, in these days of competition and free trade, an architect on the rolls has no right to complain, either that he is not employed, or that a person not on the rolls is employed; but the vexatious part of the business is that, if the public employs what the profession calls a quack, and is deceived, robbed, and ridiculed, it unjustly says, "What is the use of an architect?"

Knowing the desire of the public to have its cake large and pretty, men calling themselves architects engage in competitions, and send the biggest and prettiest designs that occur. He who sends the biggest and prettiest is generally successful. Does the public believe that the apprentices and clerks of architects are capable of answering the purpose; if so, it is as much in the wrong as if it asked a chemist's apprentice to take off a limb or tie an artery. Yet one half of the competitors are pupils, clerks, or young men without experience; now, the public has no right to depreciate a whole profession because the apprentices are incapable. A large number of the competitors are civil engineers and builders, men estimable no doubt in their own lines, but no more fitted for such competitions than they would think an architect fitted to direct the water supply of a town, or to take a contract for the bricklayer's work of a public building. Does the public believe that the biggest and prettiest cake offered to its acceptance at the price named, is likely to be good in its constitution? A single judge might be so uneducated, but half-a-dozen or a dozen can hardly be so far wrong. This is the dilemma, either ignorance or injustice chooses a cake made so pretty and so big that it cannot be good.

To avoid this dilemma for public buildings, the employment of an architect as judge is the only course to adopt, and has been adopted in some cases; but the judge may well say that his is a thankless office, when as has been the case, he has conscientiously to report that not one of the designs sent in by the men who call themselves architects, can be done for the money; or give the accommodation required. Then the Committee generally throws aside the award, and makes a choice of its own.

It may be said that this is all very true of a committee, but that an individual is always equally unfortunate. This, however, can be justly and emphatically denied. If a private person employs no architect, his building may be whatever it will; if he employs the first packing-case maker, gardener, painter, undertaker, auctioneer, who calls himself an architect, let his building take the consequences. Ellesmere-house, Holford-house, of the present day; Burlington-house, Marlborough-house, of the past, are equally fine buildings, built by selected architects. The club-houses are generally built by competition, but amongst selected men only, as was the Royal Exchange; and at Liverpool the most sensible of the speculators offered handsome prizes to competitive designs for his new street houses. I shall say no more of architectural competition than that the principal leading architects do not enter unlimited competitions, unless justified by the importance of the occasion. Thus, in the approaching competition for the Government offices, the public will not have the advantage of the skill of half-a-dozen of our best men; and thus, also, but a few established names of repute are attached to the forty-six sets of drawings now exhibiting at King's College for the Constantinople Church.

The case of a private client with a selected architect is, as I have said, a very different one to that of a committee. Some persons complain that the client names beforehand the price which he will pay for the building that he wants, and thus confines the taste of his architect. On the contrary, the restrictions which the peculiar wants and wishes of the employer dictate, should form the pressure to make the fountain of genius play high.

Few buildings, it may be presumed, are now built under such circumstances as the East India House. It would appear that the Chairman said to the architect of the Company, Mr. Jupp, "We want a house, tell us how much it will cost." Mr. Jupp made his design and estimate, which were approved by the Board, excepting as to the front. The Board offered that subject, not the whole work, to a limited competition, I believe, or, at all events, chose another architect to design it. Mr. Jupp executed the work for less than his estimate, and the Board paid the amount, with the addition of a gratuity to him of £1,000. Such a gift was not singular in the last century, but now, we say, the more important the work the less we will pay for it in proportion.

In many cases the architect is not the offender who causes a house to be ugly—but the want of education in the client.

Frequently a good design is cut down, to save some trifling expense, and after the contract is made with the builder, one alteration after another is made by the client, the contract is void, and the bills for extras when added to the amount of the amended tender often greatly exceed the sum that would have completed the original satisfactory design for the house. It is easy for a client to say that he will make no alterations; but when a work is begun with the sole object of parsimony before the mind, one of two things happens. If there is an architect employed, beauty and utility are sacrificed to convenience and strength, the meagre starved design does not come up to the expectation of the proprietor and his critical friends, and before and after completion as much is spent in various attempts to improve the house as would have sufficed at first to make it right; but even then the building always betrays its sordid origin by its mean features, which can hardly be effaced; the unhappy architect loses his credit, and as the house will, perhaps, not fetch half its cost, the disappointed proprietor loses his money, when even a speculative builder would have known better. If there be no architect, the usual result, indeed, is that ornament, not beauty, is put on to the building at the expense of the materials and labour; the proprietor has saved the cost of an architect, and has sunk his money in a house that will frequently not sell, and will want repairs three or four times as often as a good ugly house, and those repairs will cost at least as much as the original price of the house, being immeasurably more than the value of those required for an ugly good one.

When we begin to consider the cost of a building, we find another difficulty in store for committees. The cake, reduced in size and shorn of its ornaments, is put out to tender, and the committee is puzzled by the result. The figures I produce are tenders actually made within the last two months:—

	2,800	757	400	252
	2,600	740	371	247
	2,492	695	356	232
	*2,234	*558	*319	*186
	2,198	531	314	177
	2,197	530	313	177
	2,194	520	312	173
	2,112	486	301	162
	2,005	470	286	157
	9) 20,832	9) 5287	9) 2972	9) 1753
*Average...	2,315	587	330	196

Fifty more examples of this sort of competition are at your service; there can be no hesitation in saying that the average of these would have amply remunerated any respectable tradesman: the highest amounts perhaps arose from too expensive modes of proceeding, from the expectation of large profits, and in some cases from mistakes; the lowest ones certainly arose from mistakes or intention.

If the committee prides itself on honesty, and paying no more than a thing is worth, but still wishes to pay the fair value of the building, what choice can it make in such tenders? There is an outcry if it does not take the lowest. If the difference arises from a mistake, the builder generally withdraws his tender on hearing of the large difference; but if he is in a hurry to begin, the committee may expect to have either continual quarrels, or to hear of the builder's bankruptcy with a demand from his assignees for the most extravagant value that can be put upon so much of the work as is done. A committee, by accepting such low tenders, also gets into the difficulty of spending eventually much more money than it intended. It chooses the biggest and prettiest cake which it learns that it can have for its money, and finds afterwards that it is certainly a large and good looking cake, but of flour and water only; that the other ingredients are wanting; that the building, when paid for according to contract, and perhaps not too well built for the money, will cost as much more to finish before it can be used; a result which several asylums and similar buildings have presented to their subscribers, owing entirely to the ignorance or injustice of their committees.

If an individual attempts to build without the assistance of an architect, he is liable to the same misfortune; and the quarrels which arise are amongst the nicest pickings for the barristers that can be given them, by judges who dread having to sit for several days over a case which consists of a builder's bill.

The usual way of settling a disputed account for building, is to measure all the work and pay the current price for it. This would be the honestest way of dealing in all cases, if all work were equally good and were done under similar circumstances, and if the current price could ever be strictly ascertained. It is admitted, too, that this "measure and value" system, still retained by the Government, was open to gross frauds, and that it is in want of revision; many prices still asked are those for which the best work was formerly done. Amongst other duties I have had to value bad work, and I can only liken the difficulty to the trouble of settling the precise value of adulterated food.

The great objection to building by unrestricted competition is, that it gives the best chance to the worst man, to the man who intends to break his contract or to defraud his creditors.

But no human system can be entirely free from imperfections and disadvantages. Both committees and individuals are obliged to announce that they do not bind themselves to accept the lowest tender.

If called upon to name a better method, I should feel inclined to recommend the plan of taking the first, second, or third, as might be previously settled, *below the average of tenders made*, for we so often see our respectable builders classed together in the middle of such a list of tenders, that it is evident their prices were tolerably near the truth. At all events, they are the builders to whom I should apply in a limited competition, and no doubt there are several gentlemen, themselves builders, in this Society, who will tell you that it is not worth while to compete, except under limitation, *i.e.*, that you cannot expect to get good work by an unlimited competition.

In order to build cheaply, the speculative builder, or the bad builder, resort, or connive at a system of scamping, which, if the work be executed under an architect, keeps every one connected with the building in a fever of quarrel: and which, if it is not executed under an architect, may be a great deal worse than the following picture of things which you may see daily if you will stop and look at the new houses on the outskirts of London.

The soil is perhaps clay, at first with no great drain near it; as soon as a large sewer, or a very hot season comes, the foundations of the house sink a little and the walls crack considerably. Or the soil is mere dry rubbish, and the house gradually sinks into it; this would be of less importance if the house could keep upright while sinking; or if the soil be good, the foundation, that is to say, the bottom courses of the brickwork are merely bits of stone and brick lying in a mass of mortar.

Lumps of old brickwork carefully built into new walls, and old road pavement, are not the worst materials now used for walls; indeed, in themselves they are jewels compared to the bricks, which, instead of ringing like a bell under the strike of a hammer, crumble under the pressure of a strong hand or the touch of a light hammer.

As for the mortar, it is not much better than the bricks; it ought to be made of newly burnt lime and river sand; but the lime is allowed to spoil before it is used, and the sand is sea sand or pit sand, or road sand, road drift, or road stuff, or the actual earth from the site of the premises; all these have the slight defect of either introducing vegetable rot into the new house, or of preventing the mortar from becoming hard; if good lime and sand are used, instead of being made by hard manual labour into a mass, having each particle of sand covered with a coat of lime (as to keeping it mellow, that is now never thought of), they are mixed by boys and drenched, often with foul water, for immediate use, and the mortar is supplied to bricklayers, who are engaged either by the piece or by the day: in either case it is their business to get as many bricks as they can to look laid. I have heard a man threatened with dismissal by a foreman for not laying half as many bricks again in a day as are allowed in the price of labour for fair work. Often when the bricks are good they are sometimes so dry that the water is absorbed out of even well-made mortar, which dries into a powder. But in general our bricks are porous enough, without this additional fault; and you may always suspect this is the case when there is a rush of air into the room at the skirtings: this is healthy, and consequently ought not to be altogether stopped. You will observe that when new brickwork has bits of old brickwork in it, the new settles down a good deal in the first three months, but the old has no settlement to make, so there is a crack on each side of it for some distance. Even where I have been watchful, advantage has been taken of my absence to finish a good piece of foundation with rubbish (and I have been personally threatened for persevering in having it taken up), or to put rubbishing concrete instead of stone paving; in the latter case the building owner desired me not to interfere, the foreman had told him it was safer, and cost more than the stone. Bricks are laid now-a-days with a bed of mortar, roughly smoothed out, when the bricklayer takes up a little on the trowel, wipes it off on the edge of a brick already laid, and puts the next brick in place with as little exertion as possible: when this little bit of mortar has perished, the air circulates in the wall in a manner that is advantageous to our health, but decidedly inconvenient and annoying, and the house wants what is called pointing, of which you all understand the nature, expense, and trouble; in fact, the house requires painting and papering after it. But these are not actually germs of danger sufficient to cause the house to be pulled down; they may cause alarm to the inhabitants, but danger *is* real when the soil alters its condition, when the bottom parts of the wall turn up on to the kitchen floor, when the walls and piers bulge out in the middle of their height, when the walls begin to overhang, when the bricks in the arches of the windows begin to drop out like teeth; in any of these cases I would recommend you to apply to a real architect, and if he should say, "Go out," I would take the advice if possible. Sometimes indeed, we hear of a few wedges being lightly driven into cracks, with the advice that the tenants should "go" if the wedges fall by their own weight out of the cracks when the cracks get larger. Some persons are so strong-minded as to sleep without further precautions in such a house: others have some one to sit up all night and watch the wedges; but I recommend that little bells, or, better still, detonating balls, should be fixed to the wedges, because the old nurse or watchman might go to sleep as well as the rest of the family.

A building may be really dangerous, yet give no sign of the fact to most observers. A house may appear very dangerous without there being any real cause for its demolition. I suspect that we borrowed from France or Germany the system of tying one or more houses together with iron rods, which announce their existence by a sort of coal-plate fastened on the outsides. This affords an object for decoration, which has not yet been treated successfully in London, but abroad these plates (which are technically called anchors) are full of significance and loveliness of form and grace of design, to which the beauty of colour might be added.

Among the little defects of the public, I am inclined to place the notion that an architect should be able to say whether a house is in danger or not by simply looking at it. Some architects certainly have an apparently instinctive appreciation of real danger, as some physicians can foresee apoplexy; but the medical man gets the aid of the tongue, the pulse, the stethoscope, and a statement of the internal feelings,—the architect is generally allowed, like the Eastern physicians, to see the skin of his patient, but not to touch it. There is, perhaps, no outrage upon domestic comfort and private property more resented than the sensible attempt of a surveyor whom the public may employ to examine a house. Does he want to see if the roof and chimnies are sound; there is no way out to them except through a hole big enough for a child, but scarcely for a man, and if he puts his head through, he generally sees that unless he means to risk his neck, he had better send for a long ladder and get up outside. The connexion between long ladders and broken slates, and the consequences, are familiar, of course, to many present. If he wishes to see that the floors are sound, and wants to have a board in each floor removed, it would seem that he had done an injury to one of the family; or if the house be empty, and he tries to see what sort of bricks are behind the stucco or plastered front of the walls, the landlord watches him as he would a thief; but the great explosion of wrath is caused by a hint as to the foundations and the drains; in fact, the surveyor who goes that length had better be a man able to control his temper. Yet all these are points on which a prudent man ought to be satisfied before he takes a house for seven years, and much more before he buys house property.

Fortunately, however, there are other indications of the state of the health of a house, and I will liberally put you in possession of some of the principal ones. If you walk over a house and find that the walls are cracked or damp, that the paperhangings are changed in colour, that the floors shake, that the stairs creak, that the doors and windows have not fitted, then you may be sure that you are among the elements of a haunted house, and that you had better not enter it again without professional advice. I run no risk in this liberality, for people are found to take houses with a clause that "no dancing is allowed on the premises." We all know cases where the supper has been demolished by the ceiling, and now we go to houses where the ground and first floors are propped up on the occasion of an evening party, though *no* dancing is contemplated.

But neither the public nor professional men can tell without experience the signs of premature old age in a house. When it was young, the heedless, speculative builder had caused the walls to be run-up, and a bricklayer knows full well the meaning of that word. He put their footings on the wet ground, with no lead, or slate, or asphalte soles; he put no area round them, but wrapped them up with wet clay (or, perhaps, he put an area under the clay, as is sometimes rather uselessly managed); as to the chimney-stacks, they are, probably, as usual, only skins of brickwork, enclosing flues and those vast holes for the reception of red-hot soot, which set so many houses on fire; the arches of the windows and door-openings are, probably, only shams; and, as to the exterior cornices, let the coroner's inquests tell how they are made. Rotten paving-stones are laid, off their balance, on the wall, and are to be kept in their place by a load of parapet, until the day when some one steps off a ladder on to the cornice, either for repairs, or in case of fire, or until a new proprietor removes the parapet in the course of alterations and improvements. Then, perhaps, there is a large amount of what may be called hereditary disease in the house. For example, the carpenters employ sometimes decayed old stuff, and exhibit their forethought of using no more of it than can be helped, by putting that stuff at distances a quarter larger than is generally allowed for new and good materials. Of course builders who will do that will not hesitate to do without a girder or a main beam, if possible, or will put a couple of joists to represent it, and will put unseasoned brestsumers to carry the whole weight of a front upon story-ports that will bend, literally bend, under the weight of the brestsumer, before the brickwork goes upon it at all; or will carry a whole house upon little iron columns, which are so small that they act like bradawls, and cut at top and bottom into these walls, which, of course, leads to settlements. As to partitions, so slight that we must not lean against them until they are lathed and plastered, but so framed that if a tenant wants to cut a doorway in them he cuts the one piece of wood which holds the whole together, I am inclined to deem them less prejudicial than roofs, heavy enough in appearance, but of decayed or unseasoned wood. I must not, however, fail to give to our modern carpenters in London the credit of making two new joists, or two new boards, out of a single old one. At Brighton, however, they can, and do, get three floor boards out of a single old one. It is, perhaps, rather unscientific to use the half-joists in the present way **V**; they would, undoubtedly, be stronger if laid **Λ**, but then there would be nothing to nail the boards upon. The joiners are certainly to be pitied who are sent into a house to put their slips of dry wood into the crevices between each pair of floor-boards that have shrunk, and to make the skirtings fit close to the floor; but it is generally considered best to remove the doors which not only have their panels split, but are so twisted that when they are shut at the top a rule may be passed near the bottom. A very usual cause of gradual and unseen decay in a house is the roof. The small-sized slates split and let the water in, and are laid so badly that the water gets in if they do not split. They are fastened with iron nails that decay and let the slates slip and cut the gutter, which is either of zinc or lead, and in both cases too thin, and so leaks; the junction of the slates with the walls is puttied up with cement, which cracks and lets the water in; the gutter is not deep enough, and overflows; and the rain-water pipes are so small that they easily get stopped.

The fall of ceilings is not always a mark of danger; the plasterers have covered the partition and ceiling timbers so liberally with laths, that there is no room for the plaster to be pushed between them and turn over, so as to make what is called a key, which in fact is to fasten it to the laths; it will not stick of itself to the laths for any length of time if there is the slightest tremor in the house—children playing in the room should be taught that if they are very uproarious the ceiling may tumble upon them, as in the case of a school lately. The great quantity of water used in making the mortar for plastering, kept a house very damp for some time formerly; but now the drying is forced by braziers full of charcoal in each room; habits of tape and rule, and a deplorable want of scientific knowledge, invariably put a brazier under the flower in the centre of the ceiling; the room becomes very hot, the flower and mouldings begin to crack and perhaps to fall, whilst cracks of infinite variety as to shape and magnitude appear on the ceiling and the walls. That is to say, this happens only when the doors are left open, for many people shut them, and the charcoal fire goes out soon afterwards. In a few days the plastered walls are so many fields of blisters, arising from the badly burnt lime in the mortar; but this passes unregarded, for the painter and paper-hanger have yet to come.

The painter attempts to disguise all defects with paint and putty, but as the work is done in a damp house, every patch and spot of the knotting or covering of the bad wood, and of the nail holes filled with putty, can be seen through the finishing coat of paint—the paint, however, is to blame partly, for it has hardly been paint at all in the old sense of the word.

The paperhanger is equally unlucky; he does his best, I suppose, to get the joints of his papers to match, but it tries the temper to see a good red flock paper with a white line at each joint, and to see half the colours disappear just because the papers were hung before the plastering was quite dry. When that is the case it is usual to see if the grates have not got rusty and so stained the chimney pieces; that stain nothing that I can name will remove.

But what does all this matter? We see along our suburbs whole rows of houses unfinished or partly finished; when the plasterers begin their work, an inscription says, "This desirable (or this excellent) family residence to be let," and Karswilliams Lodge is actually let in time to allow the board to be used for the next house—and so on along the row.

Our forefathers were usually so short-sighted as to lose a year's rent, by waiting so long before they painted and papered, and the medical men seem to think that a damp house is not so safe to sleep in as the wet plaids of which we have heard. But the house is taken; let the tenant look to the rest, because, after all the trouble of moving furniture, perhaps new, a fire is lighted for the first time and in the best room, probably to receive the bride on her entrance to home. You may imagine her exclamation when she ventured into the drawing-room, and was straightway saluted by what Bulwer felicitously terms a joyous dance of those monads vulgarly called smuts or blacks; you feel indignation at the bridegroom who exclaimed to the choking servant that he had to go to the city, and rushed out with the blacks tumultuously following him to the gate, one yard from the door-step. The money value of the fretting, and fuming, and worry, and care, consequent upon the discovery that a chimney will not draw, may be calculated; but when half-a-dozen chimneys rebel, the sum is beyond belief—of course the clouds of smoke that rebelliously will not roll up the chimney, but prefer going out by the door or the window, are endured in the hope that when the chimney is dry, all will be right, but in the mean time the ceiling, the paper, and the paint get discoloured, and the tenant must have no fire, or go to a chimney doctor. This functionary, generally a white wizard, engages to unbewitch the chimney with a patent top, good in some cases on principles which he does not understand, and when at last the patient victim will try no more tops, he gets as a parting blessing the hint that perhaps there is a brick too much, or perhaps a brick too little, in the chimney.

A guileless and uneducated portion of English householders living in London, also appears to have a belief that all these points fall under the notice of the district surveyor. He is to be paid, the Act of Parliament says, and of course he is to do something for his money. Several district surveyors could tell you that they are often expected to do for their fee of shillings, as much work beyond what the act requires, as an engineer would charge guineas for. It is desirable that the fiction of every Englishman's having a knowledge of the laws, was in this case a fact; the district surveyor's duty is simply, on the part of the State, to watch the building owner, the architect, and the builder, and to see that they do not, from ignorance, carelessness, wilfulness, or misapprehension, transgress certain rules laid down in the Act.

If the public expects that any architect can possibly see every brick laid, every heap of mortar made, every piece of timber cut, every slate laid, in short every thing done, it makes a mistake which should be rectified. It might as well expect Mr. Rowland Hill to weigh every letter that passes into the Post Office.

If the public will avail itself of unlimited competition, and will not pay the builder a fair price for his work, the class of honest builders will die out, and in all our houses we shall see one or more faults like those which I have just described, without the least exaggeration, and for most of which proof can be found in the newspapers of the day, and for one or two of which, taken separately, proof will be found in the experience of my audience, or of their friends.

Thus are houses built to be sold, and the question arises can any better houses be built under the present system of competition?

It is want of education, and also fashion, which allows the public to rent or buy any such houses at all, and which allows the builders to erect such houses; and, as the attention of the Society appears to be especially turned at present to popular education, I hope that these observations, on points which are not thus treated in any book, will be acceptable, as giving some insight into those most useful, but too much neglected, portions of knowledge as regards a dwelling. It is supposed by the public that, because all ornament has not been set aside, economy was not a great object with the speculative builder. This is a great fallacy. Where absolute *parsimony* is required, all ornament must be set aside, but when *economy* is the object, ornament is frequently requisite, for the desire to have some decoration in his dwelling is usual, perhaps inherent, in man; and speculative bad builders know the fact so well that they think rightly it is economical to spend some of the money saved by bad construction on decoration. Thus the graining or imitative painting is an effective investment of capital. There are few eyes to which colour is not attractive, and an empty house, decorated in the best taste, if that be a simple one, is not easily let. It seems necessary to hang gaudy papers, and to paint the woodwork in imitation of oak and maple. The moment the house is furnished this effect disappears; the spots of gaudy paper that appear among the furniture are obtrusive and uncomfortable; as for the woodwork, nobody sees whether the imitation be good, bad, or indifferent; and there only remains the varnished marbled paper of the staircase—that is economical, because the colour is desirable as giving an air of comfort, and spots of dirt are supposed to be part of the pattern. There can be no faith in the cleanly habits of people who put up a varnished paper on the staircase. The question of *sham*, as it is now generally called, is intentionally avoided this evening: it is enough for my purpose to say that the imitation for doors, shutters, and skirtings, of woods that cannot be afforded, is generally a profitable investment of capital, like most of the other deceptions by which we keep up appearances—deceptions which are regarded by some earnest persons as offences less against good taste than against morality and political economy.

At first sight it would seem that the investment of capital in houses is a speculation to be recommended, either to a person wishing to purchase a residence for himself, or to a person having a little money to invest. For suppose the sum to be invested is £1,350, and he decides to build for himself by unlimited competition, he may get the following tenders, (which have really occurred,) £1,497, £1,445, £1,325, £1,298, £1,198, average £1,352. If he takes the lowest tender he saves £150 that he may fund at 3 per cent., and this will give him back his £1,200 in 70 years. Perhaps he lets the houses on lease, and avoids the repairs; but if not so lucky, he can usually manage to pocket three years' rent in seven, and if content with a clear profit rent of 7½ per cent., (instead of 10 generally asked,) he fancies that he sees in 35 years £1,350 in rent, without reckoning compound interest, and the houses to sell, and the £412 made by his original saving, and you will say that a house ought to clear more than three years' rent out of seven. But it does not, somehow, if it is not a well built house.

On the other hand, if the £1350 had been spent, the builder would only fancy that he saw in 35 years £1,350 in rent, without compound interest, and the houses to sell; for such houses will fetch no more rent from a sensible public than the bad ones in the same street; it must drop its rent to the £90, which its competitor can afford to take.

Is it in human speculation to resist these results. Whom does it hurt? Why should the builder be forced to spend the extra £150 on each house or set of houses.

The policy of honesty in building only shows itself after a time.

Every year of a badly built house may be said to cost at least one-third of the rent in repairs; if they are not done the house goes to ruin at once, and many persons have not more spare money than that which they have invested; several such houses require that a man shall have capital, and the speculative builders generally have little or none.

Our modern houses are so badly built, that even respectable builders now find it difficult to sell a lease, and can scarcely get any one to take a 7, 14, or 21 years lease; people begin to see the advantage of taking a house upon trial, and a three years agreement is the consequence; at the end of that time so much is wanting to the house, that the trouble and expense of moving is balanced by the inconvenience of having workmen in the house, and by the discovery that not far off there is another new house to be let for three years, decorated after the latest fashion.

In seven years the £1,200 houses will have demanded the outlay of £180, but the £1,350 houses nothing: and supposing that neither have let, the truth gains at once. In fourteen years the £1,200 houses will have cost £360 in repairs, but the £1,350 houses perhaps only £90. In the first fourteen years the £1,200 houses may have luckily produced £540 clear; the £1,350 houses are hardly likely to have lost more than three tenants, and would then have produced £990, so that the balance on the side of good building at the end of fourteen years is—£990 — 90 = 900 against £540 + £150 and interest, or £900 less £765 = £135 more than the bad building gives.

It is quite true that at the end of the first seven years the rents may fall equally, but the proportion of profit will alter in favour of good building.

The great damage that a bad house does to a good one in the same street, or near it, is to reduce the rents and the market values to the same level. All houses have suspicious characters in the eyes of a purchaser at auctions. But when 35 years have expired, the £1,200 houses will not be so good, with all the money spent on them, as the £1,350 houses, and at the end of 70 years, if not much sooner, their value will have perished, but the £1,350 houses will fetch about as much in 35 years as at present.

And society is interested in the question. Although the saving apparently of the £150 is considered, there is a loss to society of £720 on the £1,200 houses, but the repairs of the £1,350 houses are only a loss of £382, so that society loses to the individual £338 on every £1,200 spent in bad building. I leave the importance of this subject to yourselves.

Speaking of honesty, I must not omit to mention that the speculative builder has a great advantage over the private building owner in the discounts allowed by the trades, which allow him to sell his building, *while finishing*, at prime cost; whereas the private owner has to pay his builder that "prime cost" and a profit, and in large works probably the amount paid to the architect for looking to his interests, before he can sell, and therefore he cannot afford to sell at builders' prices; if he attempts to sell by auction, the scamped work of the speculating builders has ruined his property before he finished. But if he can hold the property, he can beat the others by his honesty.

Thus I have shown you the various characters and difficulties of the building owner, either as a committee or as an individual—of the architect as an agent, whether professional or quack—of the builder, as a monopolist and a tradesman—and of the speculative builder. I have shown you the situation of many of our old London houses according to their age, and you can see their duration as well as myself. I have shown you most of the chief defects that exist in modern buildings, with many of the causes of their early ruin. I have shown you how if good, their cost, at first, is extravagant to the building owner, but if bad, a good investment at the moment to the speculative builder; and I trust that I have shown you that if the systems which I have condemned are continued, no blame for faults of construction or want of beauty in our buildings can justly be attributed to the members of the profession to which I have the honour to belong.

DISCUSSION.

Mr. Robert Rawlinson said, that in all ages and in all countries houses and house accommodation had influenced the morals of a people as much as, if not more than, laws and teaching. Let them read any of the sanitary reports published of late years, such as those on Plymouth, Dover, Portsmouth, Penrith, and others, where it would be found that the poor and working classes generally were crowded into single-room tenements—parents and children, and lodgers, males and females, without any means of separation. Thus vice and immorality grew with a child's growth, and strengthened with its strength, inculcated by "example," which "prevails when precept fails," so that schools for vice were far more numerous than schools for virtue, and teachers of vice far more diligent than teachers of virtue. How, then, could a few short lessons in school eradicate the ingrained evil. How could temporary reformatories, in a few short months, eradicate a taint which was generations old? Schools were necessary, and it was proper to establish reformatories, but education must begin at home, and from the cradle; and that it may so begin, the poor must have proper house accommodation provided. There must be a chance of virtue given to all; there must, therefore, be means of separation of the sexes. The duty of providing or of superintending such accommodation ought to devolve on parish and municipal authorities. Gaols were built at great cost,—upwards of one hundred pounds a cell. Workhouses were built for paupers. By our negligence vice was allowed to produce criminals for our gaols; and by our negligence disease was allowed to produce paupers for our workhouses. To interfere beyond what was now done would be termed "centralisation." Model lodging-houses and model dwellings had done good, and would do more good; but individual efforts would never overtake the existing national evil. The remedy must be national. At present civilisation might be compared to a slumbering volcano—vice pervaded the hidden stratum upon which the fair outside rested. A little smoke at the summit, with here and there clinks and cracks at the sides, served to show the fire beneath. All was fair above; all was unstable and terrible below. Civilization, in the spirit of Christianity, would be the only safe remedy. Houses must be improved; all other reforms would fail if this reform remained neglected. Buildings in London streets, especially in the new West-end parts, were as like each other as peas in a pod. Like had begotten like with a vengeance. Neither the Chinese nor the Japanese ever repeated themselves more than our modern builders had done; and one of the worst features about such houses was that the better they were the worse they were. A West-end Terrace or Square house was so well constructed as not to admit of ventilation; the walls were solid, as per Act of Parliament, and all the parts were so perfectly fitted as not to admit fresh air, which could only be obtained by ventilation; hence, their perfection of workmanship was an evil, unless combined with scientific construction.

Mr. Ashpitel said the paper of his friend Mr. Papworth had been very slightly directed to the subject which had lately occupied a great deal of attention, viz., the dwellings of the poor. The paper rather treated of the larger descriptions of dwellings in and about London, and therefore he feared it would be somewhat confusing the subject to mix up one with the other. With regard to what were termed respectable dwellings, it would hardly be denied that within the last thirty or fifty years the quality of those houses—notwithstanding that materials of every description were much cheaper, and although the Legislature had removed the duty upon bricks, glass, timber, and other articles used in building, and had done much with a view to get better houses—yet it could not be denied that the houses were infinitely worse; and it was a fact that vast numbers of houses built prior to the year 1700, and let perhaps at rentals of £100 a year, were worth more years' purchase than houses built twenty or thirty years ago. It was unpleasant to speak of his (Mr. Ashpitel's) own profession, and to argue that in these cases a competent architect should be employed to look after the buildings, and to see that they built good houses. It was, however, a very extraordinary thing with regard to buildings, that it was almost the only branch of trade where an individual in a matter of business trusted wholly and entirely to another whose interests were diametrically opposed to his own. As soon as it was known that a person was about to build upon an extensive scale, there was a number of persons immediately ready to "earwig" him, as it was called. They would say, "what is the use of having an architect: the owner had much better do without, and save the five per cent." There was magic in that saving of five per cent. to a capitalist. The same remark applied also to the subject of repairs. It was one of the strangest anomalies of the day — that men should be found to place implicit faith in the saving of five per cent. by the non-employment of an architect. Let them take the case of a man who was going to lay out £10,000 in building; he would higgle with an architect to obtain his services at four per cent. upon the outlay, and was it to be wondered at that men who entered upon a matter with so narrow a spirit should become a prey to those whose interests were opposed to their own. Let them look at what was doing in France—let them compare what was doing in Paris with the best work about London. There were honourable exceptions, no doubt, and amongst them he might mention the late Mr. Cubitt, who, although to some extent perhaps a speculative builder, yet always did his work well. There were, however, millions of money spent in the metropolis, and they saw nothing for it compared with what they saw in the sister metropolis of Paris. In the latter city it was justly considered that there must be a union of education with practice—the union of the long study of the artist with the experience of the man of business. What had been lately done in Paris threw London into the shade. The money expended in building in Paris within the last three or four years was probably not one-hundredth part of what had been spent for the like purposes in London, and yet they saw to what advantage it had been laid out in the former city. That city was now beginning to claim pre-eminence over the renowned Italian cities. The Rue de Rivoli was shown to the foreigner as a work which could hardly be matched in the world. The system had operated frightfully with reference to the poor. The building of the dwellings for the poor in this country for many years past had almost entirely fallen into the hands of the lowest class of what were called scamping builders. They ran up buildings which looked well outside for a little time, but which soon let in wind and water through the walls and roof, having been put up with an utter disregard to the health and the morals of the persons who were to inhabit them. He thought a great deal more might be done with regard to the dwellings of the poor than had yet been accomplished. The different inventions that had come before them from time to time, for warming, ventilation, and other sanitary matters, which he could not now enter upon, had been woefully disregarded. These questions had, he was aware, been taken up by several gentlemen now present, and he hoped he might be allowed to say to some extent by himself. A very peculiar task had devolved upon him lately. Near to him was a district inhabited not by the poorest class, but by skilled labourers, men earning from 25s. to 30s. and 40s. per week. There was more difficulty to house those people than any other class. What were called the £10 houses were not adapted for them; and to get self-contained houses for those who could afford a higher rent was a matter of difficulty. Look at the £10 hovels in London, and there was nothing better to be had until they got to £28 or £30. This necessitated the taking of a house and cutting it up into lodgings; and there commenced one of the great evils of the present system. He had been working at this problem for a long time, and had hoped to have done something towards its solution; and if Mr. Rawlinson would fulfil his promise of bringing this subject before the Society he (Mr. Ashpitel) would feel the greatest pleasure in placing what few facts and figures he was in possession of at that gentleman's service, and he believed some very interesting results would ensue from it.

Dr. Arnott, F.R.S., said the paper had not taken up, as he had anticipated, this painfully-interesting and important subject, in a sanitary point of view. This being the case, any observations he could offer would lead the meeting into a different field of discussion. He expressed his gratification at the offer of Mr. Rawlinson to take up the sanitary consideration of the question, and when that time arrived he (Dr. Arnott) would be happy to express his opinions upon so important a matter to the community at large.

Dr. Waller Lewis said, the author of the paper appeared to object—with a professional feeling which they could all understand—to competition amongst architects for building houses or large public edifices. He had no doubt that the system of competition, like all other human schemes, had its defects. But he was inclined to doubt whether the converse of the proposition would be found to be true, that all buildings intrusted to architects, even of first-rate reputation, without competition, would be erected as they should be. He was conversant with most of the large public offices of the metropolis, and with many of those of the provinces, but he must say that many of those edifices, built under the direction of architects of first-rate reputation, and, as a rule, without competition, were designed without any regard to the health, comfort, or convenience of those whose ill fate it was to inhabit them. A very important edifice that he was in the habit of visiting constantly, had been so planned, that the air and light appeared to have been most jealously excluded from all the parts where these were most required. A short time ago, he had inspected a large provincial government office, upon which, he was informed, upwards of £15,000 had been recently expended in repairing and improvements, under an architect of repute, and although nearly 100 officers were employed there, while numerous gas lamps were pouring out their injurious emanations to be inhaled by the men, no measures whatever had been taken to remove the foul or to supply fresh air. Thus, if there were evils attached to the system of competition, as stated in the paper, there was no certainty that a building entrusted to any picked architect would be erected as it ought to be; yet in these public buildings no expense was spared. There was one edifice he would point to in which competition amongst architects had been found to pave the way to a great evil, he meant the New Palace at Westminster. When that building was contemplated, competition for designs was invited, a certain amount of money being named as the cost, which was not to be exceeded. Very many architects sent in their designs, which were exhibited in Westminster-hall, keeping strictly in view the amount intended to be spent in its erection. Others, however, paid no attention to that point, and upon the principle of unlimited expenditure they were, of course, able to furnish more magnificent plans than those who kept within the limit of expenditure laid down. This, he thought, was a breach of public morality which ought not to be unpunished. Architects who inspected the various designs for the Palace, perfectly well knew that many of them could not be carried out within the limits of expenditure assigned, and most probably their designers were perfectly cognisant of that fact. The most beautiful design certainly was selected, but would any one say that the terms of the understanding as regards cost were attended to? Now he (Dr. Lewis) contended that the plans on that great occasion ought to have been within the limits assigned for competition; and there seemed to be some immorality in sending in beautiful designs which could not be carried out for double or treble the amount stipulated; and he believed if Parliament had been made aware of the ultimate cost of that edifice, they would hardly have sanctioned so enormous an expenditure. He thought one reason why architects were not more generally employed in giving plans for houses, &c., than they were, was that, as a body they overlooked social and sanitary arrangements in a manner that could hardly be expected from gentlemen educated as they should be in all things. It was of the highest importance that all buildings should be well ventilated and well aërated. Good food was of great importance to the health of a people, but air was more important than food, inasmuch as they could live two or three days or longer without food, whilst they could not live a quarter of an hour deprived of air. And yet this seemed to be the last thing studied, or rather, a subject not studied at all by architects. In many of the public buildings with which he was acquainted the ventilation had only been an afterthought, and was therefore badly contrived—in fact, a makeshift. The paper contained many points of interest and importance, and one practical matter was alluded to in the fact of smoky chimnies where an architect had not been employed; but he might be allowed to state that he had lately visited the house of a nobleman, upon which £5,000 or £6,000 had been expended in alterations, and after they had been completed, under the directions of an architect of the highest eminence, almost every chimney in the bed-rooms smoked so much that it was impossible for the family to light fires in those rooms. This occurred entirely owing to the faulty construction of the new roof. He, therefore, thought it was partly the fault of architects themselves that they were not more generally employed than they were. The question, however, in which he felt the deepest interest had been but lightly touched upon in the paper. That was the erecting of proper and healthy houses for the poor, but that was not a subject which could be discussed in a part or even the whole of one evening. He hoped Mr. Rawlinson would not delay the paper he had promised on this subject. The speaker then alluded to his recent visit to Paris, where he had remarked the desire that was evinced on the part of the government to improve the dwellings of the operative classes, but one great impediment to that movement was found in the fact that it was inexpedient, on political grounds, to congregate any considerable numbers of the working classes together in one locality. It was on that account that the "Cités ouvrières" were not encouraged by the authorities in that magnificent city. Happily no such impediments to the march of improvement in this respect existed in this country. They knew of no instance in which the concentration of the working classes in healthy homes had originated any political disturbances, and they had no fear of any mischief of that sort. On the contrary, he believed that the very opposite effect would be produced by giving the artisans of this country more healthy and therefore more happy homes. He had very strong hopes that the government would take up this subject as the foundation of all moral and social improvement whatever, not only as regards their own *employés*, but also as a powerful incentive and example to wealthy manufacturers and other owners of property to "go and do likewise."

Mr. Elliott said that it was no easy matter to obtain for the public that most useful of all things, a good house. Houses around London and other large places were built on land held for 60 or 90 years' lease, a fatal evil, for people did not like to invest their cash and care on that which would in the end be taken by another. Hence, a house, which ought to be built in the most solid and endurable way, was manufactured of the worst materials, and put together so that it might just stand over the term of lease and then tumble down. To alter the tenure of land in this country was almost hopeless. It was, therefore, almost hopeless to obtain dwellings that were safe, comfortable, and wholesome. The public would not be protected against knavish builders by the mere employment of architects; there were knaves among them, and many fools, who would conspire with the builder to rob the public. Ignorance was a greater enemy to good houses than knavery—architects and builders were alike destitute of common sense—and there was a club-house in the City where some most instructive and astounding blunders had been made, such as would hardly be pardonable in a house built by the sons of Noah. Perhaps the most ready way of relieving the public from the stupidity and rapacity of builders would be by writing a small tract, indicating the things that were proper for a good house—a sort of house-hunter's *vade-mecum*—and it would be a most economical use of public money if there were, at some public place, say the Museum of Economic Geology, a series of models of houses, giving plenty of choice, say six of each, at prices, say—£500, £1,000, £1,500, £2,000, £3,000, £5,000, or thirty-six models. There was desire enough on the part of the public for a good house, but the public knew not what they really wanted, and they required instruction about houses as about all other things; and, going even further than that, the outside of a row of houses or a street was public property, and, while the inside must be made convenient, the outside must be made to subserve structural beauty. If men took away fresh fields, green hedge-rows, and luxuriant trees, they must be constrained to put up graceful façades. For all this a strong government was indispensable, which would and could compel obedience to regulations so connected with the people's health, comfort, and enjoyment. The only really ornamental and luxurious architecture in this country was to be found in our prisons, as at Holloway and Reading, or our asylums and reformatories, as at Colney Hatch or Redhill. If the humanity-mongers had only bestowed as much care on the homes of honest workmen, as they had done upon the palaces of thieves and paupers, we should have had something in domestic architecture to be proud of.

Mr. WINKWORTH said that he did not rise for the purpose of discussing the general question so ably opened up by Mr. Papworth, but to confirm, from his own knowledge, the statements made by Dr. Waller Lewis, as to the residences provided for the poor at Paris. He had had the honour of an audience of the Emperor in 1854, at the instance of this Society, it being part of his business to obtain the assistance of the French Government towards providing economical accommodation for such English artisans as might be disposed to visit the Exhibition of 1855; and he had therefore previously acquainted himself with the existing facilities for that object. Amongst others he was shown over a large building in the Faubourg St. Antoine, which was being fitted up for the accommodation of about 300 persons, under the direction and at the risk of a society, nominally French, but principally composed of well-known English philanthropists, which building contained every appliance necessary to comfort (cuisine, dining-rooms, and plenty of water,) but one, viz., drainage. In conversation, however, with his Majesty, and M. Fould, le Ministre d'Etat, and Mr. Clark, the representative of the company, it soon became evident that the want of this cardinal desideratum was deemed of comparatively small importance, the objection to the building, as an ultimate residence for French workpeople, being, as Dr. Lewis had hinted, a political one. It was thought dangerous to have so large a number of operatives under one roof, especially in so revolutionary a locality, all which was rather implied than said in so many words. In the course of the conversation his Majesty produced a diagram of a large vessel, to be moored in the Seine, opposite or near the "Annexe" to the Exhibition, and asked him (Mr. Winkworth) whether, if fitted up as proposed, it would suit our workpeople. He was obliged in reply to point out the fact that, being below the level of the road, and the means of ventilation being necessarily imperfect, and also taking into account that in August, when the visits would probably take place, the heat would be very great, he feared that our people would hesitate to avail themselves of the proposal. His Majesty then said that they had already arrived at the same conclusion, and were glad to find their views confirmed. Returning to the immediate question, Mr. Winkworth then went on to say that on subsequent visits to Paris, he had seen other houses in the Batignolles fitted up for the residence of operatives, free from objection as to size and sewerage, which were fully inhabited, and he had reason to hope that the mass of persons dislodged by the destruction of so many houses to form the magnificent street alluded to by a previous speaker, probably the finest in the world, viz., the Rue Rivoli, would find much better accommodation in the vicinity of Paris, with all those modern conveniences which were essential to health, comfort, morality, and content.

Dr. MILROY remarked that as the paper had not embraced the sanitary part of the question, upon which Mr. Rawlinson had promised a communication to the Society, he had but few remarks to offer upon it. The first thing which struck him on coming into London, some 25 or 30 years ago, was that in a city where space was more valuable than in any other city in the world, so little advantage had been taken with regard to the height of the houses, by which means space was obtained equivalent to superficial area upon the surface of the soil. He, however, found that this matter was beginning to be attended to, as was observable in the more recent erections in the city and other business localities, where the houses were run up to a height before unattempted. In rural districts, where space was of less value, this became a matter of less importance, but it was paramount in crowded and thickly populated localities, and where also a great consideration was to have the labouring population located as near as possible to their places of employment. In cities abroad, such as Paris, Geneva, and other places, this matter was particularly attended to, and coming as he had done from Edinburgh, he was particularly struck with the contrast afforded in most parts of London, to the lofty buildings in the latter city. The other matters calling for attention in connection with this subject, were a proper water supply and good drainage of the houses, but the chief point he would notice was that the space to be gained in lofty buildings, had hitherto been so much neglected in the metropolis and other large cities in this country. Great economy would result from a change in this respect.

Mr. PEARSALL thought this Society might prove a valuable medium for diffusing the information which had been suggested by Mr. Elliott. He alluded in terms of commendation to the measures taken by many large employers of labour to provide dwellings for their workpeople, instancing the case of Mr. Titus Salt, of Saltaire, and Messrs. Ransome and May, of Ipswich.

Mr. SPARKES HALL said he had tried, on a small scale, the plan alluded to by the last speaker, but it had failed in the object contemplated from the fact that it was at too great distance from the locality where the people worked.

The CHAIRMAN proposed the thanks of the meeting to Mr. Papworth, for the able paper in which he had that evening opened the subject of house construction. Within the time allowed for the reading of a paper it was impracticable to have introduced more than a portion of the subject. If, from the prominent part given, most usefully, to the fraudulent insecurity of construction of houses as they are, it had been intended to imply that the main object should only be to ensure the solidity of construction of houses as they were, the attention of the meeting would have been occupied to little purpose. The cases of loss of life from falling houses, from the visible and attendant circumstances, made strong public impression, but measured statistically, as he (the chairman) had been accustomed to measure the operation of causes, when he could obtain the means, the cases of death from those visible causes—the want of solidity of construction—were absolutely only as units to the thousands of cases of disease and death, and dangers, from invisible causes, arising from defective arrangements in the most solid constructions. Chemically speaking, houses as they were, scarcely less than houses as they are (except accidentally), might be called inverted receivers of the invisible and poisonous products of decomposition, from invisible cesspools, from invisible and permeable drains of deposit, which acted like the neck of a retort, to which the old sewer of deposit commonly served as a bulb. To these invisible products were added those arising from the vitiation of the air by breathing, by combustion, and by other operations. The regular action of the buildings as inverted receivers was only prevented during the day, partly by the opening of doors and windows, and often by the permeability of the structure, by reason of the defects noted in the paper read, but at night, when the doors and windows were closed, the shutters shut, and the window curtains drawn, the action of houses, as they were and are, might be tested by the sense of smell of those who first entered them, from the fresh air in the morning. Houses as they were had no merits in this respect, and in them the noxious operation of these invisible causes was only mitigated by greater accidental dilutions, greater space and, in the mansions of the highest class, by less crowding. Even the palaces of royalty had not been exempted from these evils. Even in the new palace of the legislature, after all the expenditure upon it, a chairman of committees had been almost stunk out of his chair, by the products of decomposition, emanating from an evaporating surface, of upwards of one hundred ordinary cesspools left at its basement. Now, however, new standards had been arrived at, which served for the measurement of the extent of loss and danger arising from the invisible products of bad arrangements in construction. To these standards public attention could not be too seriously or too constantly directed, namely, the various model dwellings. In some of these dwellings the death rates were reported to be as low as eight in a thousand; in various others the death-rate had kept steadily, year after year, at little more than thirteen in a thousand; the death-rate common to the particular class of occupants living in dwellings as they were and are, being generally thirty in a thousand; the death-rates of the general population living in the immediate vicinity of these model dwellings being twenty-seven in a thousand; and of the whole population of the metropolis, high and low, in open and close districts, in houses as they were and are, being twenty-two and twenty-three in a thousand. The model dwellings were only models in the abolition of that poison-pit, the cesspool, in the abolition of the old permeable brick-drains of deposit which required cleansing, and were, in fact, extended cesspools—in the substitution of an improved water-closet or soil-pan apparatus, and of improved tubular drains, which, when properly adjusted in respect to size and fall, required no cleansing, and insured the immediate and complete removal of all excreta from beneath the sites of dwellings, before they can enter into any of those stages of decomposition in which the noxious gases are evolved. These new dwellings were only models further, in these points—that there was some regular ventilation provided, though imperfect; that in their management, overcrowding was prevented, and that water, though not of the quality which a proper administration would insure, was carried, as a means of cleansing, into every tenement; that there were proper sinks for the immediate removal of all foul water, and dust-bins on the outside, whence the contents were regularly removed, shafts being placed over them to carry away effluvia. Such arrangements had now been extended to large numbers of old houses as they were and are, without any change of the population, and with the like results, the almost total abolition of typhus and other epidemics. He wished particularly to note, that these results had been achieved by house drainage alone, or by drainage within the precincts of private premises, and independently of any alterations, viz., the general sewerage works. He noted this because ignorant, or interested and mischievous efforts, had been made to divert the public attention from house drainage works and from the removal of cesspools from beneath houses, to questions of general sewers and general outfalls, which could only be properly adjusted when the new house drainage works were completed, and which, if executed independently, would not alter the death rate. This might be proved from instances where new sewers were provided, but the houses themselves remaining unaltered, the heavy death-rate still continued. The most important practical result obtained at the recent Congress of Bienfaisance at Brussels was the corroboration of the standard achieved in this country, of the death rates obtainable by improved structural arrangements within houses as they ought to be. The delegate from Cologne had stated, that whilst the houses in that town immediately surrounding the model dwellings were ravaged with cholera and typhus, the inmates of these had an immunity from the epidemics. The delegates from Holland, Turin, and German towns, attested similar results, which had been previously arrived at by the examination of the causes of the disease, which showed that little less than one-half of the general mortality of populations was preventable by structural means. In his (the chairman's) report on the general sanitary condition of the labouring population of Great Britain in 1842, he had reported a general extension of the average of their lives to be practicable. In what had been done in the varied instances to which he had referred, and others which he might cite, he claimed the practical realisation of that promise. Now what did these standards prove was due to the condition of houses as they are in the metropolis? A loss of more than twenty thousand lives, and a reduced duration of the period of life and health and working ability to all who lived in them. To the nation at large the loss was not less than one hundred and seventy thousand lives per annum. It was a subject of greater national importance than any foreign wars, for from what external enemies could we be in danger of such loss of life? It was really of greater importance than any question of political liberty, for what political slavery was there now to fear under which little children would be decimated, or worse than decimated—under which more than one-third would be slaughtered before the expiration of their fifth year, as in the metropolis, forty per cent.; in Manchester, forty-seven per cent.; in Liverpool, upwards of fifty per cent.? The political strength of a nation was dependent on its industrial prosperity, and its industrial prosperity on the amout and duration of the bodily strength and working ability of its population; and what political question was really so great as the one which involves the duration of the working ability of every adult workman by ten years or more? He was glad to hear the unanimous response to the suggestion—that distinct questions of sanitary construction might be brought before the Society, and he was happy to have ground for the hope that those questions would be treated with the anxious attention commensurate with their vast importance,

A vote of thanks was passed to Mr. Papworth.

The discussion, having lasted to a late hour, was terminated without Mr. Papworth being called upon for any remarks in reply.

The Secretary announced that on Wednesday evening next, the 22nd inst., a Paper by Dr. R. Angus Smith, of Manchester, "On Disinfection," would be read.

PHOTOGALVANOGRAPHY.

In June last, the Council awarded to Mr. Paul Pretsch, late manager of the Imperial Printing Office at Vienna, the Society's Medal for his "Application of Photography and the Electrotype to the Production of Engraved Copper-plates for Printing," termed by him Photogalvanography.

The Emperor of Austria has lately presented to Mr. Paul Pretsch the Grand Gold Medal "For Arts and Sciences in Recognition of the Artistic Perfection of the Specimen Prints which Mr. Pretsch has submitted to his Majesty."

NEW ZEALAND FLAX.

The following notification is made in the New Zealand Government Gazette, of Dec 24th, 1856.

Colonial Secretary's Office, Auckland, December 20th, 1856.

The Government of New Zealand is prepared, subject to the undermentioned conditions, to give rewards to the amount of £4000, for the discovery of efficient means for rendering the Flax, and other fibrous plants of New Zealand, available as articles ef export, viz:—

£2000

To the person who shall, by some process of his own invention, first produce from the *Phormium Tenax*, or other fibrous plant indigenous to New Zealand, one hundred tons of merchandise.

£1000

To any person, other than the person entitled to the first reward, who shall, by some process of his own invention, next produce from the *Phormium Tenax*, or other fibrous plants indigenous to New Zealand, one hundred tons of merchandise.

£1000

Viz.:—£200 to each of the first five persons, other than those entitled to the first and second rewards, who shall by any process, whether of his own invention or not, produce from the *Phormium Tenax*, or other fibrous plant indigenous to New Zealand, twenty-five tons of merchandise.

The merchandise must be saleable as an article of export from the Colony of New Zealand, and have been produced at a cost not exceeding 75 per cent. of its value at the port of entry from which it is exported; and the process used must be fully made known with a view to the discovery being at once made available to the public.

His Excellency the Governor of New Zealand will from time to time appoint Commissions, to consist of not less than three persons, to act at such places as circumstances may require, and each claim for reward will be referred to such Commission as may be considered the most convenient for its proper investigation. The acts of the majority will be deemed the acts of the Commission.

Each Commission shall be at liberty to adopt such means as it may deem most fit for determining the value and cost of production of the merchandize, for ascertaining the process employed, and for fully investigating in all respects and reporting upon the validity of any claim.

Every claim for reward must be preferred in writing before the 1st January, 1859, to the principal officer of Customs at the port of entry nearest to the place where it is desired that the examination of the merchandise shall take place, who will at once proceed to ascertain whether the full quantity in respect of which the reward is claimed, is ready for examination, and if such quantity is ready, he will give a certificate to that effect, dated on the day on which he shall have ascertained the fact, and such day shall be deemed to be the day on which the merchandise was produced.

Whenever any officer of Customs is required to go more than three miles from his residence, his travelling expenses must be paid beforehand by the person requiring his attendance, and he cannot be required to attend a second time if the quantity was found deficient on the first occasion.

One-half of any reward will be paid at once to any person whom a Commission shall report and the Governor shall have determined to be entitled to the same—after which no other claim to the same reward will be entertained—and the other half upon satisfactory proof being given to the Governor of the *bonâ fide* sale of the merchandise in Europe, at an advance of not less than 20 per cent. upon the *bonâ fide* actual cost of the article landed in Europe.

By His Excellency's command.
E. W. STAFFORD.

PREVENTION OF ACCIDENTS IN CONNECTION WITH SCAFFOLDING.

The following remarks and suggestions, for the prevention of accidents in connexion with scaffolding erected for building purposes, or for the repair or restoration of Cathedrals, Churches, Music-halls, and other interiors, are earnestly recommended to the attention of architects, engineers, builders, masons, painters, decorators, plasterers, and others:—

It can hardly be doubted that many of those painful occurrences termed "Accidents," which so often end in the loss of life or limb, and bring desolation and poverty into the homes of the working classes, are really not the result of inevitable circumstances, but arise from the absence of common precaution, and may not unfrequently involve a large amount of culpability. Acting under this impression, and with an earnest desire, for mere humanity's sake, to lessen, if possible, the number of casualties (whether to workmen or to individuals passing below) which occur in connexion with building and repairing operations, the writer, who is a disinterested party, suggests the adoption of the following precautions:—

Rope-nets, of a three-inch mesh, and strong enough to resist any pressure likely to be applied to them, either by men or by materials, should be made in pieces 24 feet in length by six feet in width or depth, at the corners of which, as well as at every three feet distance on the edges, should be securely placed stout galvanised iron rings, through all which should run a rope to make the net or nets fast to the upright scaffold poles, on which should be fixed somewhat stouter rings, or cleats, for the like purpose. The net (formed, if necessary, of several pieces united) should be drawn quite close to the front of the scaffolding, and be shifted from time to time, so as to form a sort of gallery, wherever work might be going on.

Nets of similar strength and dimensions[*] and furnished with rings, exactly as above, should also be drawn close under the loose foot-boards, the outer edge of the underguard thus formed being fastened to the lower edge of the front or upright net by a rope passing through the openings in the nets and through the iron rings, at each of which latter the rope might be half-knotted for additional security. A rope should be also passed through the rings of the inner edge of the under-guard, and be made fast to some column or beam, or other part of the building itself.

When the foot-boards are bolted or otherwise fixed down to the ledgers or cross-supports, the under-guard might be dispensed with, provided the boards and supports are all perfectly sound, and the front-guard well secured close to the scaffolding.

The front net, with another net attached to be drawn under the scaffold boards in use, might be suspended from pulleys fixed to short projecting arms or cranes at the top of the scaffolding, so as to be easily swung free, and be shifted up and down whenever necessary; care being always taken to secure the front net to the upright poles and to draw the under net quite home, either to the inner scaffold poles, where used, or to the building itself.

It is suggested, also, that the upright or front net should be carried round the ends or sides of the scaffolding, so as to form a sort of gate for the passage up of workmen or materials.

For underguarding wide-spread scaffoldings, put up for the repair or decoration of Cathedrals, Churches, Music-halls, or other spacious interiors, especially in the case of roof or ceiling operations, as many nets as might be necessary should be laid on the ground, edge to edge,—(and if they were all of uniform size,[†] with rings at three-feet distances, &c., they would fit and unite easily, and several parties to a contract could join their nets)—and a rope, of the same gauge as the nets themselves, should be laced in and out, to unite the various pieces firmly, the rope being half-knotted at each ring for additional strength; and the whole being raised in convenient portions and secured close underneath the scaffold boards. Thus any number of nets could be joined, and the largest floor of loose boards rendered comparatively safe. The edge of the scaffolding, wherever exposed, could also be "guarded" by carrying the upright nets along it, and making the rope passing through the top rings fast on each side of the building; the net being stiffened by the insertion of a few upright struts of wood or iron into the foot-boards or lateral poles, or by a line carried to a higher part of the scaffolding or building.

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[*] For "under-guarding" street scaffolds 12-feet lengths might be more convenient, and they would fall in very well with the 24-feet nets. Tarpaulins or canvass-sheetings might be used, if preferred.

[†] The suggestions for using rope-nets for front guarding and underguarding scaffolding appeared (without details) in the *Builder* of the 22nd November, 1856, besides being alluded to in a subsequent number of that paper; and they appeared in detail in the *Building News* of the 16th January, 1857.

Were the precautions here recommended generally adopted, it is believed that not only would many accidents to the operatives themselves, whether from their own heedlessness, from the use of decayed or defective boards, from stepping back to view their work, or from what are familiarly called "bricklayer's traps," be prevented, but additional protection would be afforded to persons working or passing below, whether in the street or the edifice, against injury from the fall of planks, bricks, implements, &c.

The writer also desires to call attention, without alluding to particular recent accidents, to the necessity of a distinct understanding, in all building and repairing operations, as to the individual, whether the builder, or his foreman, or other party, responsible for the strength and proper construction, in a word, adequacy, of any scaffolding; and also to the question how far buildings might be erected from the inside, and external scaffolding be dispensed with.

Upon or immediately under all scaffoldings covering the footway, especially in London and large towns, a tarpaulin or guard of other impervious material should invariably be placed to prevent the fall of bricks or other articles, as well as annoyance to passengers from dust, &c.

PRINTING MACHINES.

Mr. Charles Knight, one of the Jurors at the Paris Exhibition, in his Report to the President of the Board of Trade, on Class XXVI.,* makes the following observations in reference to Printing Machines:—

"I have alluded to the printing machines of France, in which several important improvements have been applied to the principle of the cylindrical machines in common use in England. In the Paris Exhibition several machines, offering the advantages of more perfect inking, and of preventing what is called 'setting-off,' showed that the attention of the French printers had been more directed, than with us, to the practicability of producing the finest work by the machine instead of by the hand-press. Some of our artists, who have watched the dependence of the wood-engraver upon the printer, have long been of opinion that the equal operation of the cylinder is superior to the irregular force of the hand-press. But the heads of our printing establishments have generally considered that the cylindrical machine was only calculated to save labour, and not to produce fine work. Our machine-makers have, therefore, made various labour-saving machines upon the principle of flat pressure, which, as it is the principle of the hand-press, at which the most expensive work was produced, was thought to be the only principle for a more perfect machine. The French, on the contrary, have turned their attention to the perfection of the cylindrical machine; knowing that it had natural advantages which could not be obtained by flat pressure. When a sheet of paper is brought into contact with an inked surface of types, by being laid flat on that surface, a large volume of air has to be expelled by the heavy platten operating at once upon the whole surface. The cylinder, on the contrary, touches the type and produces the impression upon the paper, line by line, and there is no atmospheric resistance to be overcome. The French printers have, therefore, sought for the improvement of the cylindrical machine. The single-cylinder machine of M. Dutartre produces work which cannot be excelled by the most careful operations of the press. It prints only on one side, and the 'form' passes under a double set of inking rollers, at each end of the table, before it receives the impression. In the double-cylinder machine of the same inventor, a waste sheet of paper is interposed so as to prevent 'setting-off,' and thus both sides of the paper may be printed at once, without leaving that blurred impression of one side which so commonly disfigures machine printing. The French printers now do their finest work by the cylindrical machine, and much of their common work by the hand-press.

"I think, upon a candid examination of the average work of the French printers, that, on the whole, it is superior to that of the English, as regards the evenness and clearness of the impression. The use of improved cylindrical machines has much to do with this. But there is another cause of inferiority not so easily to be overcome. Our paper is inferior, taking the general quality of printing paper. It is not made of so good material as the French; and although, considering the difficulty of obtaining good material, the manufacture has been greatly improved, yet an English sheet of paper has not that substance and surface, without which the most careful printing cannot be effective. The paper-duty, compelling the use of expedients for keeping down price, produces that delusive article of commerce which, bleached, sized, and glazed into a sheet of white paper—a product of much rubbish and little rag—is rotten or harsh—has one rough side and one smooth—resists ink, unless saturated with water—has to be vamped up again, after printing, with rollers and hydraulic presses; and, when formed into a book, requires to be handled with a tenderness that presupposes books not made for use."

Home Correspondence.

LODGINGS FOR WOKKING MEN.

Sir,—The lodging-houses alluded to at your last meeting are undoubtedly models of comfort, but they cannot be afforded by any but first-rate artificers. Hence it was that I conceived an inferior description of lodgings (described some years ago in the *Builder*), but which at the same time afforded suitable accommodation for a family consisting of boys and girls, with their parents, as well as, subsequently, dwellings of the lowest grade. In both of these provision was made for warming and ventilating them, though each family was to receive food from a common kitchen. This plan was invented by Sir Samuel Bentham, for workmen's houses at Sheerness, and though not presumed to be perfect, still it may afford hints to others as the means of ensuring cleanliness, warmth, and ventilation. Part of these plans differs from any others, in that the entrance to each lodging was from an external gallery, a circumstance that seems essential in point of health and comfort, as when they are connected any workman's contagious malady is likely to be communicated to the other inmates.—I am, &c. M. S. BENTHAM.

26, Wilton-place, S.W.

Proceedings of Institutions.

Bucks and Berks.—The Public Examination of the Bucks and Berks Lecturers' Association, notice of which was given last autumn, will be held at the Mechanics'

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* Drawing and Modelling, Letter-press and Copper-plate Printing, and Photography.

Institute, Sheet-street, Windsor, or Saturday, May 2, commencing at two o'clock, and concluding at eight. The prizes will be divided into two classes—I. For the members of Institutes and Reading-rooms. First prize £3; second, ditto, £1. For this class the examination will embrace all the subjects of which notice has already been given. II. For the members of Night-schools and Village Evening Classes. First prize £1 10s.; second ditto, 10s.; third ditto, 5s. For the second class the examination will be specially limited to the following subjects:—Reading, elementary arithmetic, writing, the outlines of geography and of history. N.B.—Candidates will, however, be at liberty to make choice of the class of prizes for which they will prefer to compete. It is requested that the names of all candidates be forwarded to the Rev. E. Hale, Eton College, on or before the last day of April.

London and South Western Literary and Scientific Institution.—The seventh annual general meeting was held on Thursday, February 26. Mr. F. J. Macaulay in the chair. The report of the committee states that the usual fortnightly (winter), and monthly (summer), arrangements of lectures have been continued. The former has proved very popular and successful. The attendance has been such as rendered it incumbent on the committee lately to reconsider the internal arrangement of the building, with a view to increased accommodation. In this they were fortunate enough to obtain the assistance of the President, through whose interest, kindly exerted with the Directors, they have been enabled to make such an addition to the lecture-room, as will in future afford every accommodation for still larger audiences. As regards the summer arrangements, the committee, on referring to the experiences of other Institutions, are not surprised that, despite the high character of the lectures provided, the attendance has not been so numerous as during the winter session. They will still, however, endeavour to continue the summer course. The committee have pleasure in announcing a very handsome donation of books from Messrs. Smith and Co., of 186, Strand, and the library is now in a much improved state. The progress of the two drawing classes is very satisfactory, but the committee regret that similar success has not attended other branches of the Institution, in consequence of which they have discontinued the chess class, French class, and vocal music class. The evening school continues in active operation, and is well attended. The average number of boys present during the last year was forty. The abstract of the accounts shows that the receipts for the year ending December 31st, 1856, were £166 0s. 10d. The school account shows the receipts for 1856 to have been £50. The following gentlemen were then elected as officers for the ensuing year:—Lewis Crombie, Esq., President. A. Morgan, Esq.; J. Beattie, Esq.; A. Scott, Esq.; W. F. Godson, Esq.; and J. M. Thorne, Esq., Vice-Presidents. Mr. F. J. Macaulay, Hon. Secretary and Treasurer. It was also resolved,—That the thanks of the members be given to the Directors of the Railway Company, for their continued interest in the Institution; and that, in conveying this resolution to the Directors, the President be requested specially to notice their late act of kindness and consideration in improving and increasing the internal accommodation of the building.—Resolved: That the thanks of the members are hereby given, by this meeting, to the President and Vice-Presidents, for their co-operation and support during the past year.—Resolved: That the thanks of the members are hereby given, by this meeting, to Mr. F. J. Macaulay, for his services as honorary secretary and treasurer.—Resolved: That the best thanks of this meeting be given to Messrs. W. H. Smith and Son, for their handsome donation of books.—Resolved: That a cordial vote of thanks be given to Messrs. Waterlow and Sons, for their very liberal terms in regard to the printing for the Institution.—Resolved: That the thanks of the members be awarded to the Managing Committee, for their past year's services.—Resolved: That Mr. T. Hawkins is eminently entitled to the best thanks of the members, for his continuous support of the Institution, and that they be conveyed to him by the unanimous vote of this meeting.—Resolved: That this meeting desires to record its sense of Mr. Pratt's valuable services to the Institution during the past year.—Resolved: That this meeting has much pleasure in recognising the value of Dr. Halle's services, as Master of the Evening-school. The meeting, after a vote of thanks to Mr. Macaulay, for his conduct in the chair, then separated. The winter session was brought to a close on Thursday evening, the 9th instant, on which occasion Mr. James Howe (of the choir of Westminster Abbey) gave an interesting and amusing entertainment, entitled, "Music and Musicians." The lecturer was ably assisted in his vocal illustrations by Miss E. Lyon, and the Misses Howe, Messrs. Buckland and Hill, all of whom contributed greatly to the enjoyment of the evening. The lecture-room (which has recently been enlarged and improved at the expense of the Railway Company, who continue an active and generous interest in the Institution) was well filled. In concluding the proceedings of the evening, Mr. F. J. Macaulay (the Hon. Secretary of the Institution, and Chairman of the Committee of Management), after expressing the pleasure derived by the Committee and members from the evening's entertainment, addressed the meeting on behalf of the Committee. The proceedings then terminated with every expression of satisfaction from all present.

MEETINGS FOR THE ENSUING WEEK.

Mon. London Inst., 7. Mr. T. A. Malone, "On Photography; its present condition and most important applications."
Architects, 8. Mr. Ashpitel, "On the different Theories respecting the Forum at Rome, particularly those of the Commendatore Canina." Part II.
Chemical, 8. I. Prof. Strecker, "On a new Alkaloid existing in the juice of flesh." II. Prof. Bloxom, "Some remarks upon the juice of flesh." III. Mr. J. Horsley, "On the Analysis of Urine."

Tues. Royal Inst., 3. Mr. J. P. Lacaita, LL.D., "On Italian Literature—Origin of the Italian Language—Early Writers."
Syro-Egyptian, 7½. Anniversary.
Civil Engineers, 8.
Linnæan, 8. Prof. Owen, "On the Characters and Subdivisions of the class *Mammalia*."
Pathological, 8.
Statistical, 8. Mr. S. Brown, "On the Statics of Fire Insurance."
London Inst., 3. Mr. E. W. Brayley, "On Mineralogy and Crystallography."
Royal Soc. Lit., 3. Anniversary.
Society of Arts, 8. Dr. R. Angus Smith, "On Disinfection."
Geological, 8. Mr. J. W. Salter, "On a fossil Crustacean from the Lias Bone." II. Prof. Huxley, "On a fossil Crustacean from the Carboniferous Strata." III. Prof. Ramsay, "On the Geology of Strath, Isle of Syke."
Archæological Association, 8½.

Thurs. Royal Inst., 3. Prof. J. Tyndall, "On Sound, and some associated phenomena."
Antiquaries, 2. Anniversary.
Royal Society Club, 6.
London Inst., 7. Mr. T. W. Burr, "On the History and Instruments of the Royal Observatory at Greenwich; and of other celebrated Observatories and Instruments, with the principal discoveries made by their means."
Numismatic, 7.
Philological, 8.
Royal, 8½.

Fri. Royal Inst., 8½. Prof. A. E. Ramsay, "On the Evidences of Peculiarities of Climate during the Permian epoch."

Sat. London Inst., 3. Prof. Robert Bentley, "On Systematic Botany, with especial reference to the natural systems of arrangement."
Royal Inst., 3. Prof. E. Frankland, "On the Relations of Chemistry to Graphic and Plastic Art."
Royal Botanic, 3¾.
Medical, 8.

PATENT LAW AMENDMENT ACT.

APPLICATIONS FOR PATENTS AND PROTECTION ALLOWED.

[*From Gazette, April* 10*th*, 1857.]

Dated 9th March, 1857.

676. James Denby Lee, Shipley, Bradford, and James Crabtree, Windhill, Calverley, Yorkshire—Improvements in power looms.

678. William Tytherleigh, Birmingham—Improvements in the manufacture of bullets and shot.

682. Edward Cook and James Stokes, Birmingham—Improvements in certain parts of metallic bedsteads.

684. Frederick Simpson, Redhill, Reigate—An improved mode of forming a screw in the necks of bottles, jars, and other similar vessels.

686. Carl Heinrich Julius Wilhem Maximilian Liebmann, Fartown, Huddersfield—Improvements in the purification of water, and the preparation of materials requisite for the process. (A communication.)

688. William Edward Newton, 66, Chancery-lane—Certain improvements in steering apparatus for ships and other vessels. (A communication.)

690. James Garth Marshall, Leeds—Improvements in machinery for preparing flax, hemp, China grass, and other fibrous substances.

692. William Henry Barlow, Derby, and James Samuel, Great George-street, Westminster—Improvements in cast iron sleepers for railways.

694. Frederick Alexander Fitton, Ardwick, Manchester—Improvements in certain machines for preparing, spinning, and doubling cotton and other fibrous substances.

Dated 10*th March*, 1857.

698. William Charles Day, Strand—Improvements in portmanteaus.

700. James Hamilton, Rochdale—Improvements in coating iron and other metals with metallic substances.

Dated 11*th March*, 1857.

702. Robert Lewis Jones, Chester—Improvements in regulating clocks by electricity.

704. William Makin, Hollingworth, Cheshire—Improvements in furnaces and apparatus for generating steam.

706. Simeon Denham, Strafford-square, Wakefield—A self-acting machine for the delivery of postage and receipt stamps.

708. John Robert Reid Humfrys, Salford—Improvements in apparatus for burning gas.

710. James Davis Cooper, 26, Great James-street, Bedford-row—Improvements in producing engraved surfaces from surface printing.

Dated 12*th March*, 1857.

712. Albert Viscount de Waresquiel, and Julien D'Helle, Paris—Improvements in railway carriages.

714. John Avery, 32, Essex-street, Strand—An improved method of preserving butter. (A communication.)

716. John Shaw and William Manwarning, Britannia Works, Banbury—Improvements in machinery or apparatus for cutting or reducing turnips or other vegetable substances.

718. William Edward Newton, 66, Chancery-lane—Improvements in the process of, and apparatus for, tanning. (A communication.)

Dated 13*th March*, 1857.

720. Emmanuel Berger and Jules Edouard Matile, Paris—Improvements in machinery for beating and brushing carpets.

722. William Ramsey Nevins and Joseph John Yates, New York—improvements in preparing and baking bread and biscuits, and in machinery employed therein.

724. William Hesketh, Accrington, Lancashire—Improvements in looms.

Dated 14*th March*, 1857.

726. Charles Cowper, 20, Southampton-buildings—Improvements in the manufacture of artificial leather, or a substitute for leather. (A communication.)

728. Robert Macdonald, Glasgow—Improvements in sewing or embroideridg textile fabrics. (Partly a communication.)

730. Joseph Pimlott Oates, Edrington, Warwickshire—Improvements in machinery for the manufacture of bricks, tiles pipes, and other articles made of plastic materials.

732. Henry Bradley and Helmit Wray, Hull—Improvements in beaters used in thrashing machines.

Dated 16*th March*, 1857.

734. George Marshall, Morpeth, Northumberland—An improved saw-setting apparatus.

736. James Thompson, Black-Ruthven, Perth—Improvements in mowing and reaping machines. (A communication.)

738. Henry Martin, Hanwell—Improvements in apparatus for the supply of water to steam boilers.

740. Jules Mo[illegible] 19, Rue de l'Echiquier—Improvements in warming and vent, ilating.

742. Richard Archibald Brooman, 166, Fleet-street—Improvement in apparatus for splitting leather, in order to manufacture tubes, sheaths, and other articles. (A communication.)

Dated 26th March, 1857.

843. Uriah Lane, 46, Regency-square, Brighton—An improvement in the transmission of motive power.

845. William Thomas Clarke, 11, Cottage-place, City-road—A portable metallic spring mattress.

847. Dominico Tomasini, Great Coram-street—Improvements in the construction of easy chairs and chamber commodes.

849. Augustus Frederick Butler, Ceylon—Improvements in machinery for pulping coffee.

851. Jason J. Palmer, New York—Improvements in the construction of steam boilers.

853. George White, Port Glasgow, Renfrew—Improvements in weaving.

Dated 27th March, 1857.

855. Emil Von Lowenstein, 3, New-street, Bishopgate-street—Improvements in the construction of ovens for the manufacture of coke.

859. George Sugden and Jonas Briggs, Bradford—Improved machinery for weaving checks or figured fabrics.

861. Charles Martin, 87, Castle-street, Reading—Improvements in working signal apparatus on railways.

863. William Ross, Glasgow—Improvements in apparatus for regulating the passage of fluids.

Dated 28th March, 1857.

867. Edward Blackett Beaumont, Woodhall, Barnsley—Improvements in lamps and apparatus used in coal mines.

869. Hippolyte Benigne Girard, Paris—Improvements in insulating telegraphic wires or conductors, and in apparatus for stretching such wires.

871. John James Russell, Wednesbury, Staffordshire—Improvements in the manufacture of metal tubes.

Dated 30th March, 1857.

873. Arthur Neild and Nathaniel Buckley Sutcliffe, Ashton-under-Lyne—Improvements in treating or cleansing certain descriptions of cotton waste.

875. David Jack, Glasgow—Improvements in washing or cleansing textile fabrics and materials.

877. William Childs, jun., Brighton—Improvements in the construction of expansible boxes, cases, and receptacles.

879. John Henry Johnson, 47, Lincoln's inn-field—Improvements in warming and ventilating apartments. (A communication.)

881. Arthur Granger, High Holborn—An improved manufacture of safety envelope.

INVENTIONS WITH COMPLETE SPECIFICATIONS FILED.

893. Richard Egan Lee, 3, Giltspur-street—A portable printing apparatus, adapted alike for moveable type, lithography, and copper-plate.—1st April, 1857.

962. Gilbert Burrington, Chudleigh, Devon—Making the stop funnel for the prevention of waste of liquids whilst bottling or transferring them from one vessel to another.—6th April, 1857.

WEEKLY LIST OF PATENTS SEALED.

April 14*th*.

2400. Richard Sumner.
2401. John Knowles, jun.
2406. George Guillaume.
2407. Joseph Henry George Wells.
2408. Edward Hallen.
2409. James Burrows.
2410. Bennet Johns Heywood.
2415. Alfred Tooth.
2418. Charles Napoleon Wilcox.
2458. Josiah George Jennings.
2460. Anthony Lorimier.
2466. John Cowdery Martin.
2508. William Benson.
2519. Thomas Allan.
2527. William Septimus Losh.
2582. Jean Louis Marie.
2533. Adolphe Aubril.
2541. Thomas Smith Henzell.
2546. Frederic Whitaker.
2569. James Coul Sinclair.
2587. William Gray and John Tate.
2844. John Carter Ramsden.
2916. Thomas Peake.
3002. Charles Fay.
3020. Theodore Dethier.
271. James Thom.
328. John Henry Johnson.
416. William Edward Newton.
420. Thomas Wingate.
421. Charles Wye Williams.
435. James Cooker.

Patents on which the Stamp Duty of £50 has been Paid.

April 6th.

814. John Rankin.
817. John Robert Johnson.

April 7th.

861. Samuel Colt.

April 8th.

923. Aimé Balvier.

April 9th.

843. Zachariah Round.
845. Edward Lavender.
850. Thomas Schofield Whitworth.
859. William Coltman.

WEEKLY LIST OF DESIGNS FOR ARTICLES OF UTILITY REGISTERED.

No. in the Register.	Date of Registration.	Title.	Proprietors' Name.	Address.
3966	April 3.	Hollow Flame Deflector, or Inverted Bridge for Furnaces	James Adamson and Samuel Hilton	4, Oxford-terrace, Islington.
3967	,, 3.	A Mounting for Bayonet Scabbards	John Loude Tabberner	4, Trafalgar-square.
3968	,, 4.	Self-adjusting Spring Watch Protector	Charles Gammon	2, Bury-place, Bloomsbury-square.
3969	,, 7.	The Persian Coal-box	Frederick Baker	106, High-street, Marylebone.

Journal of the Society of Arts.

FRIDAY, APRIL 24, 1857.

NOTICE TO MEMBERS AND INSTITUTIONS.

The prizes awarded by the Society's Examiners to the successful Candidates at the June Examination in London will be distributed on the morning of Tuesday, the 23rd of June, at the Society's House in the Adelphi.

The Society's Annual Dinner will take place at the Crystal Palace in the afternoon of the same day.

The Sixth Annual Conference of the Representatives from Institutions in Union with the Society, is appointed to be held at the Society's House on Wednesday the 24th of June.

The Annual General Meeting for receiving the report of the Council and the Treasurer's statement of receipts, payments, and expenditure during the past year, and also for the Election of Officers, will, in accordance with the Bye-Laws, take place at 4 o'clock on the same day.

CONVERSAZIONE.

The Society's Second Conversazione will take place on Wednesday evening, the 6th of May. On this evening the Pictures and Sketches of the late Thomas Seddon, Esq., will be exhibited, and an address will be delivered by John Ruskin, Esq. Gentlemen only are invited to this Conversazione. Cards have been issued to the members. Any member not having received his card is requested to communicate with the Secretary.

ART TREASURES EXHIBITION.

The Council of the Society of Arts have appointed a Committee to make arrangements for organizing a visit of the members to the Art Treasures Exhibition at Manchester.

EXHIBITION OF INVENTIONS.

The Society's Ninth Annual Exhibition of Inventions was opened on Monday, the 23rd ult. The Exhibition will be open every day till the 23rd of May, from 10 a.m. to 4 p.m., and is free to the members and their friends. Members, by tickets or by written order bearing their signature, may admit any number of friends.

NINETEENTH ORDINARY MEETING.

Wednesday, April 22, 1857.

The Nineteenth Ordinary Meeting of the One Hundred and Third Session was held on Wednesday, the 22nd inst., Dr. Lyon Playfair, C.B., F.R.S., in the chair.

The following Candidates were balloted for and duly elected members of the Society:—

Anderson, Alfred George
Evans, Thomas William
Hawkes, William
Odling, Dr. William
Paget, Charles, M.P.
Philbrick, F. A.

The paper read was

ON DISINFECTANTS.

By R. Angus Smith, Ph. D., Manchester.

The word infection has from early times been used in a bad sense, although it means only the power by which one body acts in its own peculiar method on another, or the action itself. In the history of words we have the thoughts of the men who formed them. This word shows the ancient method of viewing the subject to have been little different to our own. The word disinfection took its origin I imagine in France during the last century, at least I don't remember it sooner; it is applied to the removal of all disagreeable gases and odours, as well as to the decomposition which produces them; it therefore includes deodorising. The use of the word in this manner is quite in accordance with the opinion held from the earliest ages, that the infection of fever or plague was either the same as, or distinctly allied, to these gases. In ancient times the prevention of corruption was more studied than actual disinfection; bodies preventing corruption are properly antiseptics, and this is the name under which, during the last century, and great part of this, disinfectants have been chiefly classed in England.

As I propose to view the subject historically and practically, as well as to some extent, although the subject is very dark, theoretically, I shall be obliged to pick out those points only which seem to me most interesting or most novel.

One of those points which sanitary reformers have much attended to of late, viz., abundance of room with a clear open current of air around our houses, was provided for at an early period in the Eastern Empire, (Codex Just., Lib. viii., Tit. 10,) where no one was allowed to stop the view from windows looking towards the sea, so that except in kitchens and outhouses, the early inhabitants of Constantinople had ventilation secured. Many attempts were also made in Athens and Rome to have wider streets, although private interests continually interfered in both cities to prevent public benefit. In Rome the authorities were not able to make the smallest width of a street more than five feet, whilst in Constantinople it was ordered by Zeno to be twelve.

The use of drainage as a disinfectant, is from time immemorial, or the days of Hercules who saved the Elians from pestilence by draining their marshes. Many instances of this occur in early times; it is even probable that it was known before the time at which it has been supposed Hercules existed. Hippocrates studied these matters, and takes such a wide view of them that there is no doubt of his having received much of his cultivation from a fund of knowledge which one man could not accumulate. He is perfectly aware of the infectious nature of certain districts and of certain winds, and his views on the situation of towns, with regard to heat and cold, moisture, dryness, and exposure to winds, show a width of observation which for a long time the world has contracted into much smaller limits.

The disinfection of the streets and sewers was the duty of a high officer at Rome. "The prætor took care that all sewers should be cleansed and repaired for the health of the citizens, because uncleansed or unrepaired sewers threaten a pestilential atmosphere and are dangerous," (Digesta Just., Lib. 43, Tit. 23); it was forbidden also to throw refuse on the roads, (Tit. 9). This cleanliness seems to have come from the East, where now only the ceremonial part remains, and the streets of Jerusalem were said to be swept every day, although a place not considered greatly advanced in the arts. There can be no question that in these respects the world had at one time receded very much, and moderns, whilst gaining ground for themselves, have been compelled also to struggle for much that ignorance and idleness had lost. In the 12th century Paris had neither a pavement nor street sweepers, nor had it even a place into which to carry the refuse. We read in the French Dictionary of Hygiène, by Tardieu, that the filth of the streets stirred up by the horses' feet so disgusted Philip Augustus, that he ordered pavements to be made; nor was London any better. We have only to imagine the condition of certain small towns of modern times, to have an idea of the state of great capitals left in a neglected condition. Even up to last century, we read of dangerous riots in Paris, caused by the proximity of great masses of filth, which an indignant public refused any longer to endure.

Many arts have undoubtedly been lost, because in early times care was not taken to make them so well known and so necessary to comfort, that the destruction of a capital city or even of an empire, would be unable to root them out of the minds of the remaining population.

The use of antiseptics, as applied to the dead, has been known longer than any authentic history which books have handed down, and some of the processes described to us by persons who saw them carried on in a manner transmitted to them from much earlier dates, show us that in the chemical arts there has been a loss of information, which has only been reproduced after much search and difficulty. I shall not describe the process of embalming, it has become familiar to all; but one or two points are interesting. They used resins, pitch or tar, and aromatics. They washed the body with natron and cedar oil. This natron or nitre was, in all probability, as Hoefer supposes, caustic soda. It dissolved portions of the body, and it may be said to be well known that caustic soda was manufactured in Egypt. Pliny says (Book 31 c. 10) that the nitre was dried till it was light and spongy, and the water of crystallization being driven off by the sun, the fine powder produced in this way from carbonate of soda crystals was obtained.

When caustic soda was made, they seem to have sold the lime and soda together, as it is said that the "pure was very easily dissolved, and the impure very pungent," meaning, I suppose, that the impure was not dissolved on account of the lime. With the soda, oil of cedar was used. This has been called, with good reason, turpentine, which has strong disinfecting properties, but the word has evidently been used in many senses, as there are many liquid products to be obtained from cedar. It is used of the first liquid from the distillation of wood; and Berzelius, for that reason, says that the Egyptians used the pyroligneous acid which, containing some kreasote, was a great antiseptic. But mixing this with caustic soda would be of little value, nor is it probable that they would add a volatile liquid like turpentine along with soda. It is expressly said that the pitch was reboiled, or in other words, the tar was boiled and distilled into fleeces from which the product was pressed. In doing this, the light oils or naphtha would be evaporated and the heavy oil of tar containing the carbolic, phenic, or phenylic acid would remain. It was also called *picenum*, as if made of pitch, or *pissenum* and *pisselacum*, or pitch oil, a more appropriate name than that of Runge's, who called it carbolic acid, or coal oil; and still more appropriate philologically than the most recent, which, by following up a theory, has converted it to phenic acid. The distillation was made in copper vessels, and must have been carried very far, as they obtained a "reddish pitch, very clammy and much fatter than other pitch." This was the anthracene, chrysene, and pyrene of modern chemists. The remaining hard pitch was called *palimpissa*, or second pitch, which we call pitch in contra-distinction to tar. By the second pitch was sometimes meant the residuum in the copper still, and sometimes the product of distillation. A good deal of confusion therefore results. The pitch oil was resiny, fat, and of a yellow colour, according to some descriptions. They do not seem to have separated the last products well. This kreasote they used for toothache—a mode of disinfecting living bodies—as well as for skin diseases of cattle, for which it has been found valuable.

Of course this information is not got in so many words from Pliny, but it is remarkably clear, and if the classics were read with the eye of a chemist, no doubt many more of the arts would be found. As Pliny got his information second-hand, he did not write so clearly as to be understood by a person not previously acquainted with the details. It would occupy all the time of this meeting to examine every passage and show the reasons for these conclusions.

Another mode of using kreasote may be seen in the circumstance that hams were hung up on the roof and apparently smoked.

One of the earliest and most valued disinfectants was sulphur, used at least in Greece and Italy. When Ulysses killed the suitors, after putting matters in order he called for sulphur to "sulphurise" the palace, by burning the sulphur and so causing acid fumigations. It was so valued as to become a sacred method of purification; and its name in Greek, which signifies divine, was probably connected with its sacred character, although it is quite probable that its connection with volcanic districts may have suggested its solemn designation. It was burnt in lustrations as a religious ceremony; the shepherds yearly purified their flocks and herds with it, and averted the plague from them, and it lost none of its virtues in their eyes when they saw the effect which it had in purifying and bleaching their wool. In all nations the burning of incense may have had originally a connection with physical purity or disinfection, but as far as I know this act of Ulysses is the earliest instance of direct fumigation for sanitary purposes. It was probably, also, partly religious. It seems to have been a common practice then. The Italians have been obliged to re-discover the use of sulphur for their vines, and they find its value, although it takes away the fine flavour of their wines for a season, probably because it is carried to excess.

Honey was used as a preservative by the ancients, as sugar now; it is even said to have been used as an antiseptic in preserving the dead, and for specimens as alcohol with us, as we read of a centaur which was born in Thessaly, but, dying the same day, was sent preserved in honey to a museum, as we should call it, in Egypt.

They used bitters to preserve new wines, somewhat as we do hops.

Fire was used in various ways as a purifier. It was used directly in times of plague for purifying and renewing the air of towns, accompanied with perfumes and flowers, as well as vinegar and various aromatic substances, amongst which may be put pepper, mustard, and so on. The use of perfumes was carried to an extent not dreamed of here, evidently a substitute in many cases for refined cleanliness, but not entirely, if originally so, because it is constantly associated with the most refined habits, and generally with the purification of the bath.

Water, as a principal agent in disinfection, was highly appreciated by the ancients, and the most violent exertions of these late years have only put us on a level with the provincial towns of the Roman empire. Fire, as a great purifying agent, has everywhere had a prominent place, in some respects the most prominent, as it deserves to have, so that purification by fire may signify now, as it did of old, both in a physical and moral sense, the utmost state of disinfection. The fine observers on the Mediterranean had connected the departure of disease with the warming and drying influences of the sun, although it was also observed that the warmth and moisture of a south wind "tended to corruption," which was reversed by the invigorating north wind. In these opinions we have their knowledge of the disinfecting agency of heat and cold. They knew, too, from experience, that disease might be prevented by blocking up the windows towards an infected district, and opening others with a better view. Their use of drying in the enbalming process is another indication of their knowledge of the agency of water and of heat.

That great disinfecting agent, the soil, was not forgotten, and, indeed, all nations have used it, more or less, for their dead. To bury is generally the most ready mode of disposing of dead bodies. When the power of the soil is complete, we look in amazement at the amount of dead which our burying grounds absorb before they themselves become pestilential.

Whilst the ancients used various methods of preventing unwholesome decomposition in dead matter, they did not neglect the important object of putting a stop to the analogous decomposition in living matter, often the occasion of much pain. They had as many plans of curing toothache as we have, real and fancied; but Pliny mentions a method of removing a tooth without pain, by first making it anæsthetic with white hellebore. To this pitch we have only lately attained. Although we may not be able to use their processes, we must not deny them. The description is not very exact, but the mere idea proves advance. A note which I sent to the Athenæum some years ago shows this more distinctly. Phillip Beroaldo, in his annotations on Galen, says, "the kind of fishes called by Galen and other writers *narké*, the translator has very absurdly termed *stupor*, because in Greek *narké* does at other times mean stupor, whence the term in medicine, narcotics, which we use in cutting off limbs, producing a stupor so that *the amputation is made without pain*." He speaks in the fifteenth century, as if the subject were well known, whilst to us it is a great novelty, which we imagine to have been waiting till such time as chemistry should discover the proper materials.

I have brought forward anæsthetics because they are included in the classification I intend to make. In taking leave of the ancients with these few allusions to their skill, I am reminded again that these arts had been lost, and that this is a Society whose duty it is so to spread knowledge by the wisest means as to put it as much as possible out of the power of any political change, to annihilate those numerous and important arts whose names are scarcely heard of in history, but which are absolutely necessary for the existence of a great civilization. I hope it will meet with success. The arts advance slowly, and they die readily. In many respects they advance more slowly than sciences. Their progress does not depend on individuals merely. If not supported by a considerable community they cease; sometimes they require the support of a whole nation. If, at any time, any art should cease to be cultivated, it is important that, at least, a knowledge of it should not perish. In our manufacturing districts inventions are being made weekly, almost daily, that have been made by others in past days, but of which a record either has not been kept, or has been very difficult of access. For this reason I have always held it as the first duty of Manchester to obtain for herself a permanent museum of those arts which have made her great, and on which her prosperity depends—a museum which shall include all those inventions which her ingenious sons have made so profusely. We go to Paris, and find machines, invented here, but preserved there with the greatest care, as monuments of the ingenuity of the race, whilst with us, too frequently, everything is lumber in the arts but the newest pattern. I consider that such an institution lies within the strict duties of Manchester and all the manufacturing districts, at the same time that it ought also to have schools where the people may learn those sciences, which they neglect, but on which they entirely depend. Agriculturists have their own colleges and professors for themselves, at the Universities. There are no such institutions to cultivate manufactures. These institutions it is, I believe, our duty to establish; but a gallery of fine arts has carried the day—a much more alluring object, and such as I shall enjoy more than that proposed by me—but, at the same time, it must be remembered that the *intellectual* arts must flourish amongst us ere the æsthetic arts can be enjoyed.

Bodies undergoing decomposition are under the agency of forces not well understood. The living body is undergoing continual decomposition and recomposition, but an instance of decomposition which seems spontaneous in many cases, is best seen in fermentation. Here sugar breaks up into two bodies; and having begun goes on rapidly. It seems only to require a slight impulse to begin, and it starts off with great rapidity. We do not know the nature of this impulse, but the sugar is in a decomposing, breaking-up state, and it would be well if we had a scientific and universal name for this, instead of each nation having its own. Berzelius proposed *catalysis*, but added explanations which made it a new force. There are many instances of decomposition analogous, and a different force may exist in each. It was, therefore, in the opinion of chemists a mistaken view of the subject. Still, the facts are true, and the name given by Berzelius is very descriptive. It describes a body in the state of breaking up, where chemical election does not appear to act. The word applies to living bodies, or to dead bodies as in putrefaction, or to vegetable decomposition as in fermentation. As the impulse to begin is apparently small, the introduction for example of a very little oxygen, so the rapid arrest of the process is remarkable and equally unaccountable. In the higher forms of this catalytic action, viz., in life, we find it arrested by minute doses of vapour inhaled, or of certain substances swallowed, or of other substances put in contact with the blood. We find also different animals affected differently, for example, by the poison of the Tsetsec fly in South Africa, which kills horses and oxen, but is only a minor inconvenience to man. We find the same substances that destroy life acting against fermentation to a large extent, such as mineral acids, among which especially are nitric and sulphurous; also organic acids when very strong, metallic salts, strong alcohol, kreasote, empyreumatic substances, and ethereal oils or many compounds containing much carbon and hydrogen; but vegetable alkaloids, which act so powerfully on animals, have only a small influence comparatively on fermentation.

Now coming to the next stage of decomposition or catalysis of dead matter, we find that those same substances which act on living matter are capable of acting as antiferments, antiseptics, and disinfectants. They are substances which put a stop to the catalysing condition. It would be well for us to have a general word for this class of substances. I propose *colytic*, from the word κωλυω, to arrest, restrain, or cut short. Those bodies which put a stop to chemical decomposition would be called *colytics*, and the action *colytic action* or *colysis*. But it would be unwise to speak of the colytic force as distinct, even if we did not know that it is manifold, as in designating anything not well known we should leave room for clearer views. A colytic force manifests itself towards living persons in poisons, anæsthetics, anodynes, and hypnotics. In vegetable or dead animal matter as antiferments, antiputrescents, antiseptics, and disinfectants. The disinfection of some vapours is, however simple chemical decomposition. We recognise in all these forces an analogous action on which I shall make a few remarks, tending towards a theory which seems to me somewhat to remove obscurity from the subject.

Oxygen seems to begin the state of putrescence; in soldering meat in airtight vessels not a trace of air must be left behind. On allowing one bubble of oxygen to enter grape juice ready to ferment, the process begins, and is continued without more being added. Liebig said that "no other explanation (of this force of decomposition in fermentation and putrefaction) can be given, than that a body, in the act of combination or decomposition, enables another body, with which it is in contact to enter the same state." He says that the active atoms of one body influence those of another, so that, when once it is begun, "the statical equilibrium" being suspended, the motion is transmitted through the mass; the explanation is mechanical, and one of his analogies used is the crystallization caused by shaking saline solutions. But the mind requires to view the subject more nearly. Suppose a particle of oxygen to touch the matter ready to ferment, it removes a particle of carbon or carbonic oxide; the atoms of carbon or hydrogen, or both, with which it was united, are set free—they must follow their affinities. If the mass were neutral, having no sign + or — before it, oxygen at once, by its action, changes one sign to +. The sign changed to plus, or the atom containing it, converts the one next it to minus, and so the chemical action is continued through the mass; this is according to known and recognised theories, and without mysteries being involved under the word catalysis; we have a similar action in setting up bricks on end in a row, and causing the fall of tons, if we please, by the initial force of a few ounces. We have a similar instance of change of sign when water is decomposed, and hydrogen comes off at a distance from oxygen. This change of sign is transmitted through a long line of atoms; I do not care to call it electric, although it agrees with the electro-chemical theory; it is enough if we recognise the attraction and repulsion which are needed and represented by plus and minus. Now, this same action, which is referred to decomposing bodies, may be referred to the colytic action where decomposition is arrested. In this case a substance with slight affinities may unite with any product of decomposition, removing either the negative or positive element so entirely as to render the remainder neutral, or in equilibrium. It is enough to suppose the inclination to unite, although the act may be long delayed. If we call either the decomposition or arrest, by the name of *contact* action or the action of *presence*, we express a theory, viz., that mere contact or presence is enough; now, this is unfair, because we feel persuaded of its insufficiency. If we use the words *catalytic* and *colytic*, we express a fact without a theory.

The modern history of disinfectants began, conveniently speaking, in the 17th century. Boyle worked a good deal on kindred subjects, and showed the influence of air and of heat and cold. In 1732, Dr. Petit made experiments on antiseptics; he used small portions of mutton, and found how long each antiseptic preserved a piece untainted: he came to the conclusion that astringents were the best, and that their action was similar to drying. He illustrated it by saying that, as corruption comes from the separation of the particles, so preservation is attained by contracting them, or drawing them closer, as is done by dry air and astringents.

In 1750, Sir John Pringle wrote his "Experiments on Septic and Antiseptic Substances, with Remarks relating to their use in the Theory of Medicine." He recommends salts of various kinds, and astringent and gummy resinous parts of vegetables and fermenting liquors. Dr. Macbride followed him with numerous experiments. He speaks of acids being the long-prescribed agents as antiseptics. He found that even diluted to a great extent they were powerful; that alkalies were antiseptic; that salts in general have the same quality; also "gum-resins such as myrrh, asafœtida, aloes, and terra japonica;" also "decoctions of Virginian snake-root, pepper, ginger, saffron, contrayerva root, sage, valerian root, and rhubarb, with mint, angelica, senna, and common wormwood." Many of the common vegetables also were included as to some extent antiseptic, such as horse radish, mustard, carrots, turnips, garlic, onions, celery, cabbage, colewort. Lime was found to prevent but not to remove putrefaction. Animal fluids, he observes, will remain for a long time without putridity if kept from the air. He says that astringent mineral acids and ardent spirits "not only absorb the matter from the putrescent substance, but likewise crisp up its fibres, and thereby render it so hard and durable that no change of combination will take place for many years." To add molasses to this list, will complete fairly a description of his opinions.

In 1767 an essay recommending nitrate of potash in ventilation received the recommendation of the Academy of Dijon. How this was applied, the Dictionnaire de Médecine, from which I have taken it, does not say.

In 1773, Guyton Morveau proposed fumigation with muriatic acid vapours as a mode of disinfecting hospitals, &c. This was hailed as a great discovery at the time, and practically acted as a valuable step. He adduces the testimonials of men deservedly great in our estimation, to prove the excellence of his method. It was even stated that the fumes were not disagreeable. He was much aggrieved when Dr. Carmichael Smyth used nitrous fumes at Winchester, in 1780, and afterwards in the Fleet, without giving him the credit of the discovery of acid fumigation. And still more was he hurt when Parliament, in 1802, voted £5,000 to Dr. C. Smyth. But he tells us that *even* in England he found men to do him justice. Let us do him justice; he seems to have been the first that introduced acid fumigations in modern times; still, the disinfecting power of acids was known before, although not used in the same manner in modern times. But where were our classical scholars, and why did they neglect the ventilation by acid fumes, so frequent in Greece and in Rome, and distinctly written in their beloved Homer? Muriatic acid is very inferior as a disinfectant, and even in Guyton Morveau's mind it soon gave way before chlorine, which was introduced as a fumigating agent in 1791-2 by Fourcroy. This last gas was introduced into England by Dr. Cruikshank. All these acids are very violent, and fitted only for extreme cases, which ought not to be allowed to occur. Chlorine may be excepted; it may be used with advantage in minute quantities, at least for limited periods. The slight amount arising from chloride of lime seems to produce sufficient effect, although of course, not enough for extreme cases. When applied to centres of putridity, such as sewers and cesspools, the great objection to it is, that it destroys the ammonia, sending off the nitrogen as a not very pure gas. It soon acquires much moisture, loses its power, and gives a very unpleasant odour to the hand when touched. Its destruction of manures is, however, the principal objection to it.

Chlorine acts by uniting with hydrogen, acids by uniting with the compounds of hydrogen, water and ammonia. Chlorine decomposes the sulphur and phosphorus compounds of hydrogen. It will even dissolve a piece of flesh, so as to form a transparent liquid, giving off little odour. It may also be looked upon as an oxidising agent, removing the hydrogen and leaving the oxygen of water free to act, and as it is then in a nascent state, we have, as it were, a concentrated oxygen or air fitted to destroy animal matter by its active power of combination.

This latter effect may also be ascribed to sulphurous acid. It has generally been called a deoxidising or reducing agent, but it acts also as an oxidising agent of great power when it decomposes the sulphur compound of hydrogen, by giving up its oxygen. Of this it possesses two atoms, so that it ought to have double the effect of chlorine.

The power of oxygen as a putrefactive agent, is closely related to its disinfecting agency. The first action is to cause putrefaction, the second to cause oxidation or disinfection. Hildenbrand found that meat in a vessel of oxygen putrified in eleven hours. By the consent of all times the contact of putrid matter assists it, although some have demurred to this, mentioning that sulphide of ammonium prevents putrefaction. But this only happens when the liquid is very strong. Berzelius says that animal liquids may be long prevented from decay by occasional heating to 100° C., in order to remove the oxygen when absorbed. Another writer says 60° C. or 140° F. Sweeny preserved meat in water by first boiling out the air, cooling it, covering it with a stratum of oil to keep out air, and adding iron filings to absorb what might have been allowed to enter. Meat remained sweet in this way for seven months. Leuch added a covering of oil also, but used unboiled water and sulphur instead of iron filings. Meat was preserved in this way for two months.

Putrefaction is said to be rapid at 10° C. or 50° Fahrenheit under water, but in the air the same rapidity is not attained till 25° C. or 77° Fahrenheit.

Albumen coagulates at about 140° Fahrenheit. Some of the disinfecting agents coagulate albumen. Coagulalation does not prevent although it delays putrescence.

Dr. Henry (in the *Philos. Mag.*, 1831 and 1832), showed that at a temperature of about 140° Fahrenheit, vaccine matter had entirely lost its peculiar properties. He kept up the temperature for three hours. If heated for three hours at 120° Fahrenheit, it still retains its vaccinating properties. This matter if allowed to stand would then undergo ordinary putrefaction. Dr. Henry also showed that the clothes of fever patients were disinfected by exposure for one hour to a temperature of 200° Fahrenheit.

Mere drying is known to arrest decay, as it is an old but very true saying that unless dissolved (or at least moist) bodies do not act. We are told in "Anderson's Travels in South Africa," that the Damaras are accustomed to cut meat into strips, and dry it in the sun, by which means it is preserved in a climate where decomposition is very rapid. Dr. Henry's experiments show us that even after time was allowed for the infectious matter to absorb moisture from the air, the infectious decomposition did not take place, so that true disinfection had resulted.

The power of cold to arrest the movement of particles chemically as well as mechanically is well ascertained. Animals seem to be capable of being preserved for an indefinite length of time, and even inorganic bodies are preserved from chemical action by cold. Dr. Southwood Smith obtained an organic liquid by passing air through a tube artificially cooled. Guntz put a belljar over putrid matter, and cooled it suddenly, when he obtained drops of a putrid liquid. This illustrates the action of cold in infected air; to some extent it is mechanical by contracting the air and cooling the vapour, so that it can hold no more organic matter in solution. Much heat would to a similar extent act mechanically by expanding the air, so causing less infectious matter to exist in a given space. But this is independent of chemical action.

Air being the initial cause of putrefaction, it would seem strange to class it among disinfectants, but in some respects it is the greatest of all. Its first action is mechanical, as in natural or artificial ventilation. It is known that the worst plagues have arisen in great calms; crowded rooms and unchanged air increase almost every disease, whilst ventilation has a contrary effect. The action of the air on putrid matter is too slow for many of the wants of civilization, and hence the need of an artificial disinfectant. But nature herself has a mode of hastening it by giving an increased power to it under the influence of porous bodies. The porous body most in use is the soil, which is a powerful disinfecting agent, so much so that putrid matter, when completely absorbed by it, unless in excessive quantities, entirely loses its smell, and water drained from soil at a sufficient depth, is found to have lost all its organic matter, so thoroughly has it been disinfected. In doing this oxygen is absorbed, and it will be found that water containing decomposing organic matter has its oxygen removed, serving frequently as a useful index to the state of the decompositions going forward.

I took occasion a few years ago, at the British Association, to show the great value of the soil as a porous material, having the quality with other porous materials of pressing gases into a smaller space than they occupy at the ordinary atmospheric pressure, and thus mechanically compelling combination; and showed that but for this power our towns would lie upon a mass of loathsome corruption, which was now so far from being the case that the water from the soil was much prized, although sometimes too impure for drinking. This is caused by the formation of nitric acid, which is the result of purification, and not only so, but a reservoir of air or oxygen wherewith to purify still more. The water of the Thames contains nitric acid also, and this process is therefore going on constantly in that river, explaining the reason why it is not intolerable.

Dr. Stenhouse has shown this oxidising power to be very great in charcoal, as one of the most porous of bodies, and has fully illustrated its disinfecting properties by shewing that it absorbs impure gases and oxidises them, whilst it has no power of preserving organic substances, and, therefore, is an unfit substance to be mixed with manures. Mr. Condy has applied the same idea of condensed oxygen, rendered still more powerful by being also nascent, to the disinfection of putrid matter, and by a very beautiful scientific idea has produced a very beautiful liquid, completely destructive of putrid matter. It performs the same office as charcoal, but much more rapidly, and there are many cases, especially in private houses, where it will be the most convenient of any to use. Sulphite of soda has been used in France, especially for preserving anatomical subjects; and Mr. Stone, of Manchester, informs me that he used it mixed with kreasote with good effect. Alkaline salts generally are not so much disinfectants as antiseptics; they prevent putrefaction but do not remove the odour from the past putrefaction. Metallic salts have a great disinfecting power, partly from their acid properties allowing them to act like acids, and partly from the fact that some metallic oxides unite with organic matter as well as decompose certain gases accompanying putrefaction. Lead, arsenic, and mercury have been brought forward for the purpose, and the latter especially as corrosive sublimate has remarkable qualities. Berzelius recommends it for injection into the arteries, either for embalming the dead or preserving subjects for dissection. Sulphate of iron has been shewn at many periods to have wonderful properties as a disinfectant, as wonderful as it used to have when it figured in the world as the powder of sympathy. Gay-Lussac, in France, and later Mr. Young, in England, recommended the chloride of manganese, the waste product of the manufacture of chlorine; these all act as disinfectants, but it is exceedingly dangerous to put a very acid liquor to the fœcal matters to be disinfected, as the gases which come off are then worse than before. None of these salts have been so much brought before the world as chloride of zinc, and whether as a preventive of slow oxidation in decay, or of rapid oxidation in combustion, I can testify to its efficiency.

It is above ten years ago, since, in reviewing metallic salts. I was led to believe that none would be ultimately used extensively. They must generally be used as solutions. Now, solutions are unpleasant to use, as it is generally desired to remove the water rather than to increase it. In cow-houses and stables, and on shipboard for example, water and general dampness have to be constantly combated. The solutions themselves are acrid, and hurtful to the person and to clothes, and the metals have no place in agriculture; disinfection and agriculture must go hand in hand. The continually increasing price of metals shows, too, that they are demanded for other purposes. For these reasons I recommended, in a short paper to the Chemical Society, the use of magnesia or its salts, by which large crystals, containing the ammonia of urine, may be rapidly obtained. Not finding its disinfecting power sufficient, I did not proceed with it far, as I saw that something else was needful to insure complete success. But, some years later, when experimenting with my friend Mr. McDougall, we came to some conclusions which I shall relate.

We agreed that of all bases, magnesia was the best to use for the disinfection of manures, as the only one which gave an insoluble ammoniacal salt and preserved the ammonia at the same time, whilst it was an agent also employed regularly by nature in the economy of vegetation.

That of all acids sulphurous acid was the best, and its power at least equal to chlorine, but it had not the destructive quality which chlorine possesses of decomposing ammonia, whilst when it had done its work, it was either converted into a harmless solid, as sulphur, or, by combining with oxygen and an alkali in the soil, became a sulphate, another agent used by nature. In this manner we used no foreign agent, and adopted the form of ammonia and phosphoric acid, most economical and least ready to be washed away.

We believed that in most cases disinfection would not be employed at all if unpleasant odours were used, and that it would be better to prevent their formation than to allow them to form and then hunt them down with uncomfortable fumes.

We combined the base and the acid, and found that by this means disinfection was nearly completed, by the use of only a small portion of material. My belief is that in many cases this would be sufficient for the purpose, but we were not satisfied. We had tried about the same time that we tried the magnesia in 1847, the carbolic or phenic acid from coal tar, but we had not been able to produce good results by it alone. When the sulphite acted, there was still a small remaining smell which the phenic acid removed; we therefore added to the sulphite about five per cent. of phenic acid, of which the powder slightly smells. We made the compound a powder, as the best of all forms, cheapest, and most convenient for carriage. To obtain abundance of sulphite of magnesia was of course a difficulty, but we found that there were certain advantages in having some caustic lime with it in some cases, so that we used the magnesian limestone; in ordinary cases not saturating it with the acid, but adapting it according to circumstances. Although our first object was to precipitate sewage, we had no good opportunities of doing so, and turned our attention to more attainable objects. After our smaller experiments, we tried it in stables, chiefly at the Manchester Horse-Barracks, when Mr. Gardiner, of the 3rd Light Dragoons, was veterinary surgeon there. That gentleman made many experiments, and decided on its value, finding it beyond his most sanguine expectations. The mode of using it is simply to sweep the stable well and sprinkle the floor with the powder, using as much as would be used of sand in sanding a floor. The bedding is then put over it. It was found particularly valuable when sick or wounded animals were present, as it rendered the odour from the wounds, as well as from the fæces imperceptible. Lieut.-Colonel Unett, of the regiment mentioned, gave the same opinion, and advised its use on board transport ships. Through the kind and zealous interposition of Lieut.-General Sir Harry Smith, who had experienced its benefit in his own establishment, the circumstances were represented to the Secretary of War, who ordered that every transport ship conveying troop horses to the Crimea should be furnished with it. This was done in the latter part of the war with the utmost success, so much so that many requests were made for it from other transports. Its use was begun with great success in the camp, as we find from Mr. Doyne, Engineer in Chief, Army Works Corps. We could never get it introduced generally into the camp, although experience has shown that it would have remedied one of the greatest discomforts with absolute certainty. In consequence of powdering the floor with it almost daily, the manure becomes thoroughly mixed with the disinfectant. The results are remarkable. The manure does not heat or ferment, as in other cases, so that there is no fear of loss by ammoniacal gas, or by putrid vapours. The liquid which flows from it is without smell. From the arrest of decay, flies do not come around it in numbers, and the horses also are preserved from flies, a state which has a very favourable effect upon them. Mr. Murray, who has always four or five dozen of the most valuable horses on hand, says that headache has disappeared from his stables; and of lung disease, which was formerly common, he has not had an instance. The horses are healthier and in better spirits, whilst a good deal of straw is saved. They breathe air without either ammonia, which hurts the eyes of those who enter, or of putrid matter; the whiteness of the powder makes the stable appear as if constantly newly whitewashed. A curious circumstance is said by most of those who use it to occur. The stable is cooler, not only to the feeling, as we might suppose, by removing animal matter, but to the thermometer. I have not made the observations myself, but they are to be relied on, and to the feeling the change is distinct. The removal of heat I ascribe to the fact that the animal matter has ceased to oxidise. The slow combustion or putrefaction produces heat in the manure, probably also in the atmosphere itself, where the vapours are mixed with the oxygen. The oxidation and putrefaction are simultaneously arrested. It might be said that since decomposition is arrested, the manure is made unfit for plants; besides, it is known that liquids from tar put a stop to vegetable life as they do to animal. But Mr. Murray found that after having sold his manure of one year with the powder in it, he was offered double for it next year. It is therefore established that a just medium has been attained, the preservation of the manure on one side, and the health of the plant on the other.

Perhaps the best authorities as regards horses are the veterinary surgeons of Manchester, who use it and find it essential, for "sweetening the air and destroying all offensive emanations from breath, dung, or wounds."

I have heard instances, too numerous to allude to, of long standing complaints of waterclosets and cesspools being cured by a single application, sometimes not needing renewal for months, but I cannot go over the same ground twice, nor, although I read on this subject by request, do I wish to use the style of those who speak more from interest than conviction. I know that no amount of assertion will make you believe these facts till they are tried before your eyes, and for that reason have never till now spoken publicly on the subject; but when requested, I thought it might be a greater fault to shrink from such a public method of speaking my opinions, than it would be to appear to use such an occasion for merely selfish purposes. It is especially important, now that a lung disease amongst cattle threatens us, that these experiences of ours should be made known, as it appears that, quite unknown to ourselves, we have been experimenting chiefly in that direction which is most at present required, and with greater success than we had ever anticipated.

As I am not in business, and did not wish to be, the powder was called "McDougall's Disinfecting Powder." As I have shown, it is chiefly by a combination of results and plans that novelty has been produced, a novelty chiefly practical, but bearing also on science.

Our chief intention originally was to use this powder for sewage; of its value in other respects we had only a faint idea. I shall not even begin the consiconsideration of its economical value, as it will be brought forward on another occasion, but there are some points of importance which I wish to bring forward. In precipitating sewage with whatever material, great tanks have been erected outside of towns, and these are a terror to every neighbourhood. But before arriving at these tanks the sewage has passed through the town, has given off what vapour it could, and done all the mischief it was capable of doing; as soon as the mischief is accomplished it is proposed to disinfect the material.

The great object desired is to purify towns. We propose to disinfect the whole sewage of a town in the town itself, and to pass the disinfectant into the sewage at various points, so that all the main arteries may be rendered pure. Air rushing from them into private sewers will convey the impurities of the private sewers only, which each may disinfect for himself. If disinfection of private sewers should become common, the public use might then be given up. By this means we purify whole cities. The sewage water will come from the town in a disinfected state, and it may be carried to any point without any fear of creating a nuisance. If carried through an agricultural district, it may be used as liquid manure, either by drains or by the jet, without any fear of an action for damages. Without disinfection the sewage will certainly not be an agreeable neighbour; with disinfection the channel will be a more wholesome institution than our present canals. A channel like this need not be covered. To make a covered channel is naturally a most serious undertaking, and even to use the liquid manure from a covered channel will be dangerous. Sewers will then, for the first time, be unqualified blessings. At present they are dangerous at the best, and we dread every connection with them.

The state in which the disinfectant will be applied in the sewers, must differ to some extent according to the condition of the water or sewage, the principle of its composition not changing.

This, as a comprehensive plan for disinfecting towns, and rendering the use of sewage manure agreeable, is, I conceive, of great importance, nor am I aware of any such comprehensive plan ever having been brought before the public, at least not before it was proposed by Mr. McDougall and myself.

We have never had an opportunity of trying this system in the method proposed, but we had the opportunity of disinfecting a whole town. The town of Leek was attacked by an epidemic last year, and a council of medical men called on Mr. McDougall for his advice. He, amongst other things, proposed, on consulting with me, the plan above stated, and, as a temporary measure, not so much promising great good as to allay the fears of the inhabitants, he proposed disinfecting some of the principal cess-pools with the disinfecting powder. In reply to my inquiries, Mr. Dale, C.E., the town surveyor, says, "Its use was most efficient in staying the plague; never was the intimate connection between foul cesspools, &c., and disease more strikingly demonstrated. The fever and putrid sore throats prevailed most in the neighbourhoods nearest to the open sewers and cesspools. On using the disinfecting powder, the offensive smells were perfectly removed, and the abatement of the disease immediately followed. There were *no new* cases, and those under treatment at the time assumed a much milder form. We exhausted a small stock of disinfecting powder on the 3rd of January. In the course of a few weeks, when the cesspools began again to give off offensive smells, the disease broke out a second time, when the authorities ordered a further supply, and upon using it as before, the disease again assumed a milder form and eventually disappeared."

This is an extreme case, but the purification of towns by means of their sewers I hold to be valuable in all cases, and their corruption should be instantly arrested. It matters nothing to us to be told that the corruption will be arrested next morning at the distance of six miles, when a stream runs by us of the same kind without interruption. The inhabitants of London must either endure the evil, and then send it to their country friends, or they must purify the sewers themselves, the source of the evil, for the benefit of both.

I now trust that the ideas I have brought forward will be found somewhat interesting and useful to the community, as well as to the audience which has honoured me by their attention.

DISCUSSION.

The Chairman was sure the Society had been pleased with the learned paper that had been brought before them that evening. It had been his pleasure to know Dr. Smith for many years as an accomplished scholar, as well as an excellent chemist. The interesting information he had given with regard to the knowledge of this subject possessed by the ancients had been highly instructive, but there was one person to whom he could have wished Dr. Smith had referred, because he was equally well versed in the sacred as in the profane writings. The greatest hygeist of ancient as well, perhaps as of modern times, was Moses, who gave hygienic laws to the Israelites which might have been used with advantage by the English on a late occasion, both in camp and field. The instructions which he gave for the regulations of the encampments of the Children of Israel during their Exodus, proved that he had a great knowledge of hygienic laws; but though the ancients appeared to possess this extensive knowledge of disinfectants, it was a question whether their sanitary state, and their freedom from substances which required the use of disinfectants was so great as was the case in the present day. They knew that perfumes were more valued and used in those times than now, and perfumes when used to a large extent were often an index of the want of cleanliness; though, when used to a moderate extent, like flowers, they were grateful and agreeable. Perfumes as well as deodorisers were employed, not to disinfect, but to mask something that required to be corrected. Deodorisers were not necessarily disinfectants, and must in their application be distinguished from them. Disinfectants were of two classes, one class being *preventives*, and the other *destroyers*. Kreasote was an instance in the first class, chlorine in the second. The powder which had been described by Dr. Smith possessed very singular qualities. One of its ingredients was the substance known amongst chemists as carbolic acid, a most valuable and interesting substance. It was closely allied to kreasote, and was, in fact, a homologue of kreasote. It had the power of uniting with bases, and forming salts, and thus it could be more readily applied than kreasote. It prevented putrefaction; and when mixed with the sulphite of magnesia had its disinfecting properties increased. There was one point with regard to magnesia which was important in a chemical view. Magnesia rendered ammonia solid, and on that account was valuable. It not only took down the phosphoric and other salts contained in liquid manure, but carried down the ammonia also, thus preserving the most valuable and important constituent of the manure. Therefore the use of magnesian salts, with carbolic acid as a preventive, was a happy idea. He saw present many medical men as well as distinguished chemists, who he knew had given considerable attention to this subject, and he would be glad to hear their remarks upon it.

Mr. Dugald Campbell observed that he wished he could coincide with the view the chairman had taken of the action of magnesian salts upon sewage water, namely, that they would precipitate phosphoric acid and the ammonia from it; but really practically this was not the case, for it unfortunately happened that the phosphate of magnesia and ammonia was soluable to a certain extent in water, and in every case the water in the sewage of towns was far more than necessary for this purpose. In a paper which he (Mr. Campbell) had been requested to give recently, before the Chemical Society, he had shown, and he thought without any exaggeration, that the total solid matter in the sewage of London was in the proportion of one to between four and five thousand of water. He had examined every process hitherto proposed for obtaining the solid matter from sewage, and he regretted to say that there was none by which one-tenth of the value in the sewage could be secured, for the ammonia or the substances representing it, namely, the urea or uric acid, and the potash and phosphoric acid, the true valuable matters for manure in the sewage water almost entirely passed away in the water after any process as yet suggested. Of course for stables, cesspools, and such like places, where the fœcal matter was in an undiluted state, the powder mentioned by Dr. Smith, as well as many other things, would, no doubt, do very well and suppress their odour, at the same time preventing the evaporation of their ammonia. He would have been glad if Dr. Smith at the same time that he had proposed to disinfect the sewage before it reached the main sewers of the town, had shown how this was to be effected.

Mr. P. H. Holland (Medical Inspector, Burial Department of the Home Office), remarked that the hint thrown out by the Chairman ought not to be lost sight of, viz., that deodorizers were not disinfectants, and great care must be taken that they were not used as maskers of danger. Dr. Smith had not recommended the use of either as a substitute for the removal of the cause of danger and offence, and people must be cautious that they were not so applied. During the last two or three years, his attention had been called to the disinfecting powder described by Dr. Smith. He had been directed by the Secretary of State to inquire into its properties in connection with the burial of the dead. It was, in the first instance, suggested that this powder, or some similar substance, might be used as a means of getting rid of proper interments of human bodies; that they might heap bodies one upon the other, and employ this powder to prevent annoyance. But there was one thing in connection with burials in which such a powder as this would be valuable. It sometimes must happen, and often did happen, that for various reasons dead bodies were kept uninterred until they became offensive, and he had found, both by experiment and enquiry, that this powder was effective in preventing annoyance in such cases. It would be in their recollection that about two months ago, a terrible colliery explosion took place, by which a great number of lives were lost. The bodies of about 190 men and boys and of some horses, were for the most part still in the mine, and he was instructed to advise how the burial of these bodies could be managed with the least possible amount of annoyance and danger to the community. Previous experiments led him to believe that this powder was the best means of effecting that end, but at the same time he was not satisfied that it would alone prove sufficient. There was in the case he alluded to, a coal mine with an accumulation of some 8,000,000 or 10,000,000 gallons of water, in which about 200 bodies had been soaking for two months in various stages of decomposition, and therefore very offensive. These 200 bodies had to be got out of the mine and carried some two miles to the place of interment, and that, it would be admitted, was a difficult matter to accomplish without danger and annoyance. The first step was to get the water out of the mine, which, it was considered, from the great quantity in proportion to the organic matter, could not be very offensive. This water it was proposed to render less dangerous by adding lime in excess, and in the event of that not proving successful, it was proposed to add a quantity of this disinfecting powder, and, with a view to clear the mine of the noxious gases evolved, it was suggested that sulphurous acid gas would be most likely to be effectual for the purpose. It was, therefore, decided to burn sulphur in the mine. As a further precaution, instructions were given that the men who went down the pit for the purpose of exploration should proceed in the direction of the current of air and not against it; that they should enter by the down-cast shaft, whilst the putrid vapours were blown away before them. The plan adopted was to take down sheets liberally sprinkled with the disinfecting powder in which the bodies were enveloped as soon as discovered, and placed in shells lined with pitch which were embedded in sand, entombed in brick cells, closed up air-tight and covered with six feet of soil. These measures were being carried out as quickly as the bodies were recovered, and he was happy to say, notwithstanding a rumour to the contrary, not a single case of serious inconvenience or danger had yet occurred. The speaker then proceeded to state, that at the time when the whole of England was moved with grief at the harrowing details of the disasters in the hospitals at Scutari during the late war, it occurred to him to place at the disposal of the War Department a large donation of this disinfecting powder. The offer was accepted; the powder was sent, but he never heard of its ever having been used; he was quite ignorant what became of it, and, for anything that he knew about it, it might have gone to disinfect the Black Sea. With reference to the case of the epidemic in the town of Leek, alluded to by Dr. Smith, he (Mr. Holland) was in the first instance somewhat uneasy lest the outbreak of disease in that locality should have been, in some degree, occasioned by his own neglect. He had been told that it arose in consequence of the disturbance of the churchyard there, which he ought officially to have got prevented. But he was happy to find he had been misinformed, for the medical men of the place assured him that the epidemic and the state of the churchyard had no connection with each other. He felt bound to say that the information he had received with regard to the effects of the use of the disinfecting powder in the case mentioned fully agreed with the statement they had heard from Dr. Smith that evening, viz., that it had been highly successful in arresting the epidemic. It did not prevent persons being attacked by the disease, but it prevented, in a great measure, its malignity. This was a case in which it was impossible to effect the immediate removal of the organic matter to the accumulation of which the epidemic was attributed, because the sudden disturbance of a large mass of filth during an epidemic would have been most dangerous, and under such circumstances disinfection was the only available remedy.

Mr. Robert Rawlinson said he would rather hear the paper discussed on its merits by chemists, than occupy the attention of the meeting with remarks only connected in a secondary degree with the subject; but, as no other person rose, he would give his ideas of disinfectants and their legitimate use. The application of disinfectants to town sewage he would avoid, as that investigation was in the hands of a Royal Commission, of which he was a member; there were, however, purposes for which disinfectants in some form must be of the greatest practical benefit, and here Dr. Smith's disinfecting powder had been proved to be of extreme value. There were certain places which no amount of labour, mechanically applied, could cleanse, and the aid of the chemist was therefore absolutely necessary. Stables, horse-transport ships, shippons, especially milk-cattle sheds in or near large towns, cattle-ships, steamers, &c., emigrant-ships, and merchant-ships generally with bilge-water; ships of war, temporary hospitals, barracks, and wherever there were crowds of human beings and cattle; in such cities as Paris, where there were foul cesspools, and in many other places. So urgent was the necessity for the use of some form of disinfectant on board emigrant ships, cattle-ships, steamers, and merchant vessels generally, that he (Mr. Rawlinson) considered the legislature ought to make it imperative that the owners and managers should provide and use the best disinfectants; it was imperative that emigrant ships should have on board a surgeon or surgeons; the disinfectants in many cases, if used properly and promptly, might be of more value than the surgeon; at all events, the surgeon would have at command a material more powerful for good than many in his medicine chest. For fixed populations, he (Mr. Rawlinson) considered that sewers and drains should be so built and so ventilated as to prevent mischief without disinfectants within the town-sewers, and, most certainly, all hospitals, public buildings, and barracks should not require their constant use. The arrangements in barracks were at present most abominable, and disinfectants might be required, because soldiers were compelled to use one and the same room for night and day; and the barrack committee, even, in spite of the strongest evidence given them of the foul state of these rooms at night, had deliberately recommended a continuance of the system. Barracks as they were, and as they were to be, if the recent recommendations were adhered to, would require a use of disinfectants, but it was to be hoped that the barbarism of confining men to one room day and night, would be abolished. Having paid some attention to sanitary regulations, he would remark, in conclusion, that disinfectants for human habitations should only be relied on temporarily, and until more perfect structural arrangements could be carried out; for animals, that is, in stables, &c., it was probable disinfectants must ever be relied on, as no amount of draining, paving, or cleansing would render such places sweet and wholesome. Town-sewers and house-drains must be abundantly ventilated outside of the houses, and not at the surface of the streets, where, by diffusion of the gases, the greatest mischief might be worked, but, at elevations not lower than the ridge of the houses. Sewage, at its outlet or outlets, must be disinfected, or be applied direct to the land. How this was to be done in the best and cheapest way was the question. Dr. Smith's powder might or might not be the best material, but the Doctor was too honest to claim more than was due, or to recommend that which he did not know and believe to be valuable. No stable or shippon ought to be used without this powder, if it were the best and cheapest.

Dr. Albert J. Bernays said he had tried the disinfecting powder alluded to with signal success. His first experiment with it was in removing an offensive odour caused by a drain at his own residence. He had applied a thick coating of the powder, which still remained, and since its application no unpleasantness whatever had been experienced. He mentioned cases of the application of this powder during the process of emptying large cesspools, by which the contents of those receptacles were completely deodorised and the noxious gases driven off, so that the operation was performed without inconvenience to those employed in it. He had also used the powder in the wards of the hospital with which he was connected, with the most satisfactory results as a deodoriser.

Dr. Milroy remarked that the terms disinfectants and disinfection, to medical men involved two distinct ideas. Disinfectants had reference to the supposed prevention of infection being communicated from a sick person to a person in health. Some diseases being infectious, it had been supposed that by the use of certain agents the infectious properties might be destroyed, and the disease prevented from spreading, and he supposed it was in that sense that the parliamentry grant was given to Dr. Carmichael Smyth in reference to the use of acid gas for the arresting of typhus and other fevers in gaols and public establishments. Experience did not, however, warrant them in saying that the spread of infectious diseases was prevented by that means. When gases of that description were used they were associated with free ventilation; and the experience of late years had shown that the simple use of free ventilation in buildings or on board ship had in itself all the power that the use of these various agents professed to effect. He believed it was a most mistaken notion to suppose that the required benefits would be experienced from the use of chlorides or other such disinfecting agents unless free ventilation were carried on at the same time. It would be most hurtful that it should go forth to the public that the use of these agents alone would prevent the spread of contagious fevers, &c., in buildings or in vessels. The great agent of disinfection was unquestionably the continuous change of the air; and whether or not they used these agents in addition (for he did not mean to say they were not most useful auxiliaries), it would be a most dangerous thing to suppose that their use could compensate for the want of free ventilation. Mr. Rawlinson had referred to the subject of ships, which probably afforded the best opportunities for making experiments in relation to disinfection in the double point of view to which he had alluded, viz., the preventing the spread of disease, and the drawing off of vitiated atmosphere by means of thorough ventilation. In the event of disease breaking out on board ship, the simplest and best plan, in his opinion, was to disperse the patients over every part of the ship, and as far as possible place them under canvass on deck. He thought the great error generally committed in reference to infectious diseases on board ship, was continuing to treat the patients between decks, which, even in the best appointed ships was a matter of great difficulty, and therefore, wherever it could be done, the proper plan was to encourage ventilation in the ship, and, where it was possible, to bring the sick men on deck, and put them under tents. He thought one great cause of the spread of contagious diseases in a ship, arose from the fact of the men being too much crowded together. In ships of war carrying from 900 to 1000 men, the whole crew were berthed in half the space that was necessary and available. There were three decks, and instead of the men being scattered over these spaces the whole were accommodated on a deck and a half, leaving the same amount of room unoccupied. They could never hope to meet such a case as that by the use of disinfectants. The use of chlorides might correct noxious effluvia, but the only real remedy was the removal of the cause. It was a dangerous thing to trust to disinfectants where the cause of the infection was removable, and in 999 cases out of 1000 he believed the causes were removable. The chairman had alluded to the importance of some of the hygienic rules laid down by Moses for the maintenance of health in the encampments of the Israelites during their journeyings. They found that in the Mosaic institutions a primary place was given to the destruction by fire of every abomination that could be so destroyed. The remains of the sacrifices were taken without the camp and consumed by fire. The streets of Jerusalem were not only swept daily, but the material so collected was burned outside the city. He thought these matters were not sufficiently attended to in the present day. He had personally witnessed the destruction of offensive matter in the camp before Sebastopol, either by burying or burning. In the cavalry camp the litter of the horses was burned: but in the first instance it was imperfectly done. With a proper system, the accumulation of large heaps of offensive matter might have been prevented by burning, to the benefit of the sanitary condition of the army. He thought there was no question but that fire might be more beneficially employed in destroying what was offensive and injurious to health, and the refuse of the combustion containing charcoal and saline matters might be employed with good effect in sprinkling surfaces that had been polluted by the impregnation of organic impurities.

The Chairman here called attention to a specimen of disinfecting fluid before him, which he said contained a clever application of oxygen gas. This substance, which was called "Condy's Patent Natural Disinfectant,"* contained for 2 equivalents of manganese, 7 equivalents of oxygen, and these, in a state of combination, readily attacked organic impurities and destroyed them.

Dr. R. Angus Smith, in reply, said, in answer to Mr. Campbell, that he had not anticipated the removal of all the ammonia from the sewage of London by precipitation, but it would be preserved in the liquid, because decomposition would be arrested. The sewers, therefore, would give off no foul air, and lose none of their value for manure. If not disinfected the manure would be of little value at a few miles distance. A portion only of the ammonia would be precipitated. At present the liquid manure was constantly undergoing decomposition. By arresting that process it would be preserved. In the case of manure from stables, cow-houses, cesspools, and similar places, all the ammonia, phosphates, and organic matter would be completely preserved. In answer to the other speakers Dr. Smith said that he had no desire to supersede air, which was a better invention than any one which had passed through the Patent-office. Ventilation removed impurities, but in their passage they came in contact with persons and with objects. Now if the decomposition were arrested before removal, they would pass off without doing mischief. He (Dr. Smith) wished to arrest the putrefaction in the sewers, and to let the sewage pass through London without giving off offensive fumes. This plan both rendered ventilation of sewers unnecessary, and prevented loss of material. A similar result followed the use of air. Disinfection rendered the vapours that arose in hospitals, &c., innocuous, and ventilation might then be used with less violent currents of air, which, after all, did not destroy the evil, but only diluted it. Dr. Smith added that the disinfecting powder was gradually getting introduced amongst emigrant ships, where liquids were so objected to.

A vote of thanks was passed to Dr. Angus Smith.

The Secretary announced that on Wednesday next, the 29th instant, a Paper by Mr. Francis Bennoch, "On Metropolitan Improvements and Thames Embankment," would be read.

PARCHMENT PAPER.

At the Royal Institution, on the 3rd inst., the Rev. J. Barlow gave a lecture on this subject. Mr. W. E. Gaine has discovered the remarkable fact, that by a momentary immersion of paper in strong sulphuric acid, diluted with half its bulk of water, and allowed to cool, and then instantly washing it free from acid, first in plenty of water, and then in weak ammonia, it becomes endued with such extraordinary tenacity, that whereas a band of the original paper, of about an inch in width, breaks under a weight of seven or eight pounds, in its modified condition it will support nearly a hundredweight. The lecturer stated that Messrs. De La Rue and Co. had entered into an arrangement with the discoverer to introduce it into commerce, where, from its almost indestructibility, it will doubtless supersede parchment in many of its applications. Specimens of engravings were exhibited which had been so treated *after* having received the impression: the acid had in no way injured the lines of the engraving, whilst the great contraction which the paper underwent, gave a delicate softness and sharpness to the picture. Several photographs were likewise exhibited which had been printed on this parchment-paper, as it is called, the peculiar hard nature of the surface enabling photographers, the inventor states, to obtain beautifully rich tones with a far less expenditure of nitrate of silver than at present.

Mr. William Crookes, in a communication to the *Journal of the Photographic Society*, says:—

> "On seeing the really wonderful change which had by this simple means been wrought in an engraving, the thought instantly occurred to me, what would be the effect of treating a finished photograph in this manner? We know of many instances in which a strong acid exerts apparently less energetic action on bodies than the same acid diluted; and it was just possible that the metallic compound, whatever it may be, constituting the dark part of a positive paper photograph, might pass unscathed through the ordeal; the idea was at all events well worth putting to the test of experiment, and, accordingly, the same night, strips, of photographs, selected as samples of different tones of printing, and various kinds of paper, were passed through the acid according to the plan above stated.
>
> "The result was one which I certainly had not anticipated: the colour and tint of the picture, even in the most delicate half-tones, remained perfectly intact, while the powerful, yet uniform contraction of the paper added considerably to the sharpness; the paper was, besides, suddenly gifted with such great strength, that not only would it bear the roughest handling during the washing operation, without even the possibility of tearing it; but at any after-time, when finished and mounted, it would bear hard rubbing with soap and water and a wet cloth, without the slightest roughening or abrasion of the suface, if it were sufficiently dirty to render such a mode of treatment advantageous. Added to this, the surface (of an unalbumenised print) assumed a peculiar glossy appearance, giving a richer finish to the picture, without the glare which is so much objected to in albuminized pictures. Another effect, which time alone can decide whether or no it may be added to this long list of advantages, was this: a picture which was fading rapidly, was so treated on one half only; there was a powerful odour of hydro-sulphuric acid evolved, and certainly there has been no further fading since, although the short space of time which has elapsed since trying the experiment, makes it difficult, as yet, to appreciate any difference between the two halves as regards their intensity."

Home Correspondence.

DISINFECTANTS.

Sir,—During the discussion on disinfectants last evening allusion was made to chloride of zinc. Specimens were placed on the table, but it does not appear to be generally known that in the list of medical stores directed by the Board of Trade to be kept on board British merchant-ships on foreign voyages, pursuant to 17 & 18 Vic., cap. 104, sec. 224, chloride of zinc is the only disinfectant ordered to be used.—I am, &c.,

GEO. F. MORRELL.

April 23rd, 1857.

FŒCAL DISINFECTION BY FIRE.

Sir,—The paper of Dr. Smith makes out very clearly the distinction between deodorising and disinfecting, and the discussion made it as clear that disinfecting, though it may be a concomitant with, ought by no means to be considered a substitute for, thorough ventilation.

But the necessity for disinfection arises from putrefactive fermentation. For example, fresh fœcal matter is merely putrid; the constant rapid passage of fresh air, *i.e.*, thorough ventilation, would prevent putrefaction, and so also would the total absence of air.

The addition of water would at first diminish the perception of odour, and subsequently it would hasten putrefaction when thoroughly saturated.

Can we dispense with water and prevent putrefaction? I will suggest an experiment.

Take a vessel of glazed stone ware, say two feet in diameter and three feet in depth, fitting it with a cover, as a closet.

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* Dr. Hofman, in reference to this liquid, says, "I have carefully examined the alkaline manganates and permanganates with reference to their application for the purposes of deodorizing and disinfecting, for which you propose them. The remarkable facility with which these substances give off their oxygen to other bodies being taken into consideration, the idea of using these salts as deodorizers and disinfectants appeared to me *a priori* a most happy conception; but I was scarcely prepared for the extraordinary effects which the manganates and permanganates are capable of producing when employed for this purpose."—Ed. *S. of A. Journal.*

Place in it a given quantity of Mr. M'Dougall's disinfecting powder, and three to four inches in depth of the shale oil made in Glasgow by Mr. Young, or the earth oil of Rangoon.

Use the vessel so prepared for the reception of fœcal matter without urine or water till it be half full, taking care that the oil be in such quantity as always to float over the surface and thus hermetically seal the fœcal matter from access of the air.

When sufficiently full take the vessel to some gas-works and place the contents in a retort, unconnected with the main gasometer, but discharging the distilled gas into a special vessel.

The gas and its illuminating qualities may then be ascertained, and also the residual ash or coke.

If it should turn out that the oil and Mr. M'Dougall's powder will prevent all evolution of gas, and that the destructive distillation is effectual and useful, we shall obtain a new and very important starting point which may indicate the means of obtaining a pure river without costly sewers.

I believe that by fire, and not by water, is the purification of our cities to be accomplished. Fire is a destroyer of miasma—water is but an extender. The dried fœces of animals are the sole fuel in many districts of the world, and are absolutely inodorous. It is possible that, from one step to another, in our city improvements we shall gradually displace our water-closets and substitute for them oil-closets and fire retorts, heated by gas jets, which will purge and burn away our grosser excreta. I have more than once propounded this doctrine in print.—I am, yours faithfully,

W. BRIDGES ADAMS.

April 22nd, 1857.

THE TIDES IN THE SOUTH PACIFIC.

Sir,—A short time ago, in scanning the pages of an old book of Travels in the South Seas (by the Rev. J. Williams, a missionary,) my eye fell on some brief remarks on the phenomena of the tides of some of the islands, which seems to me to be so singular that I take the liberty of transcribing the passage. He says:—"It is to the missionaries a well-known fact, that the tides in Tahiti and the Society Islands are uniform throughout the year, both as to the time of the ebb and flow, and the heights of the rise and fall, it being high water invariably at noon and midnight, and consequently the water is at its lowest point at six o'clock in the morning and evening. The rise is seldom more than eighteen inches or two feet above low-water mark. It must be observed that mostly once, and frequently twice in the year, a very heavy sea rolls over the reef, and bursts with great violence upon the shore. But the most remarkable feature in the periodically high sea is that it invariably comes from the west or south-west, which is the opposite direction to that from which the tide wind blows. The eastern sides of the island are, I believe, never injured by these periodical inundations. I have been thus particular in my observations, for the purpose of calling the attention of scientific men to this remarkable phenomenon, as I believe it is restricted to the Tahitian and Society Island groups in the South Pacific, and the Sandwich Islands in the North. I cannot, however, speak positively respecting the tides at the islands eastward of Tahiti, but at all the islands I have visited in the same parallel of longitude southward, and in those to the westward, in the same parallel of latitude, the same regularity is *not* observed, but the tides vary with the moon, both as to the turn, and the height of the rise and fall, which is the case at Rarotonga." Admiral Beechey is the only person, that I am aware of, who has given any solution to the question, and he proposes as a simile a basin to represent the harbour, over the margin of which the sea breaks with considerable violence, thereby throwing in a larger body of water than the narrow channels can carry off in the same time, and consequently the tide rises, and as the wind abates the water subsides.

This Mr. Williams denies, and in proof of his assertion brings forward several arguments and states several facts, of which I select the following as most likely to bear on the point:—

1. That the undeviating regularity of the tides, is so well understood by the natives, who distinguish the hours of the day by terms descriptive of its state, such as the following, "where is the tide," instead of "what o'clock is it."

2. There are many days during the year when it is perfectly calm, and yet the tide rises and falls in the same way, and very frequently there are higher tides in calms than during the prevalence of the trade winds.

3. The tides are equally regular on the west side of the island, which the trade wind does not reach, as on the east, from which point it blows.

4. The trade wind is most powerful from noon till four or five o'clock, during which time the water ebbs so fast, that it reaches its lowest level by 6 o'clock, instead of in the morning, as Admiral Beechey states, at which time it is again high water.

Admiral Beechey's explanation being manifestly at variance with the truth, it devolves on abler heads than mine to give a satisfactory solution; and hoping you will excuse my troubling your columns with the above interesting facts, I am, &c.,

"INQUIRER."

April 20, 1857.

MEETINGS FOR THE ENSUING WEEK.

Mon. Philosophical Club, 5½. Anniversary.
Actuaries, 7.
London Inst., 7. Mr. T. A. Malone, "On Photography; its present condition and most important applications."
Geographical, 8½. I. Sir John F. Davis, "On China and the Chinese." II. Commander A. C. Gregory, "Completion of the North Australian Expedition."
Tues. Royal Inst., 3. Dr. J. P. Lacaita, LL.D., "On Italian Literature—Dante."
Civil Engineers, 8. Discussion: "On Electro-Magnetism as a Motive Power," and if time permits, Mr. G. L. Molesworth, "On the Conversion of Wood by Machinery."
Med. and Chirurg., 8½.
Zoological, 9.
Wed. Zoological, 1. Anniversary.
Society of Arts, 8. Mr. F. Bennoch, "On Metropolitan Improvements and Thames Embankment."
Thurs. Royal Inst., 3. Prof. J. Tyndall, "On Sound, and some associated phenomena."
Royal Society Club, 6.
London Inst., 7. Mr. T. W. Burr, "On the History and Instruments of the Royal Observatory at Greenwich; and of other celebrated Observatories and Instruments, with the principal discoveries made by their means."
Antiquaries, 8.
Royal, 8½.
Fri. Horticultural, 1. Anniversary.
Archæological Inst., 4.
Royal Inst., 8½. Capt. John Grant, "On the Application of Heat to Domestic Purposes, and to Military Cookery."
Sat. London Inst., 3. Prof. Robert Bentley, "On Systematic Botany, with especial reference to the natural systems of arrangement."
Royal Inst., 3. Prof. E. Frankland, "On the Relations of Chemistry to Graphic and Plastic Art."
Medical, 8.

PATENT LAW AMENDMENT ACT.

APPLICATIONS FOR PATENTS AND PROTECTION ALLOWED.

[*From Gazette, April* 17*th*, 1857.]

Dated 12*th December*, 1856.

2954. Henry Wimball, Aldermaston, Berks—Improvements in machinery or apparatus for the manufacture of bricks, tiles, pipes, and other articles of a similar nature.

Dated 31*st January*, 1857.

288. Duncan Morrison, Bordesley Works, Birmingham—A new or improved manufacture of ordnance.

Dated 27*th February*, 1857.

578. Edward Mucklow, Bury—An improvement in the manufacture of "alizarine."

Dated 3rd March, 1857.

618. James Broad, 149 and 150, Drury-lane—The application of artificial boards. or papier maché, or patent composition boards, composed (or partly so) of any vegetable fibre, and the like, either in its raw state or worked up from old substances, to friction washers of every description of wheeled carriage and cart axles, also for covering wing and dash irons, and forming heel boards for Hansom cabs.

Dated 7th March, 1857.

664. Eléonore Augustin Pagnerre, 143, Drury-lane—A machine for counting, cutting, and inserting wire in blocks of wood for the purpose of printing and stamping on linen, calico, silk, cloth, and paper, and for all printing purposes.

Dated 18th March, 1857.

746. George Farrell Remfry, Riches-court, Lime-street—A portable apparatus for working punkas and whisks.
748. Thomas Dean, Whittle-lane, near Burnley—Improvements in looms.
750. William Edward Newton, 66, Chancery-lane—Certain improvements in artificial legs. (A communication.)
752. James Withnall, Manchester—Certain improvements in the manufacture of rollers or cylinders to be employed for printing calico and other surfaces.
754. William McCulloch and Thomas Kennedy, Kilmarnock, N.B.—Improvements in stop-cocks or valves.
756. John Fox, Preston—An improved music scale.

Dated 18th March, 1857.

758. Thomas Yarrow, Arbroath, Forfar, N.B.—Improvements in locomotive steam engines.
760. François Barthelemy Loubatières, Agen, France—Improvements in the manufacture of paper, cardboard, and pasteboard.
762. Richard Talbot, Moxley, near Bilston, Staffordshire—Improvements in furnaces and in the manufacture of iron.
764. Lewis Hope, Bishopsgate Churchyard—Improvements in the manufacture of paper. (A communication.)
766. John Horace Taylor, New York—Improvements in buckets and valve seats for bilge and other pumps.
768. Joseph Lewis, Salford—Improvements in machinery or apparatus for reaping and mowing.

Dated 19th March, 1857.

770. Henry Armistead, Colne, Lancashire—An improved "picker," to be used in power looms for weaving.
772. Richard Archibald Brooman, 166, Fleet-street—An improved projectile. (A communication.)
774. Marie Amedie Charles Mellier, Frews Weir Mills, Exeter—Improvements in desiccating or drying paper and other goods in process of manufacture.

Dated 20th March, 1857.

776. Thomas Sidebottom Adshead and Abraham Holden, North-end Mills, Stalybridge, Cheshire—Certain improvements in machinery for carding cotton and other fibrous materials.
782. Charles Weiss and Henry Lister, Huddersfield, and John Mitchell, Sheepridge, near Huddersfield—Improvements in finishing woollen and other textile fabrics, and in the machinery or apparatus employed for that purpose.
784. Nathan James Greenwood, Morley, near Leeds—Improvements in spinning mules and slubbing machines.
786. John Chedgey, the Grove, Southwark—Improvements in machinery for mangling, calendering, or pressing goods.
788. Isaac Atkin and Marmaduke Miller, Nottingham—Improvements in dividing lace.

Dated 31st March, 1857.

885. John Campbell Evans, South Lambeth—Improvements in railway rolling stock.
887. Samuel Jabez Goode, Aston, near Birmingham—Aimprovement or improvements in depositing metallic alloys by electricity.
889. George Lauder and Thomas Ireland, Dunfermline, N.B.—Improvements in the manufacture of brine to be used in the manufacture of salt.
891. John Graham, Ann-street, Devonport-street, Commercial-road, East—An improved steering apparatus.
893. Anguish Honour Augustus Durant, Conservative Club, St. James's—Certain improvements in omnibuses.

Dated 1st April, 1857.

895. Charles Iles, Birmingham—Improvements in bolts for doors.
897. Benjamin Horatio Paul, Torrington-street—Improvements in the preservation of stone, either natural or artificial, also of cements and other similar compositions.
899. Charles Greeves, St. Thomas-street, Southwark—Improvements in breech-loading guns and pistols.
901. Robert Adam, Paisley—Improvements in preparing and finishing threads or yarns.
903. Lambert Perin, 2, Rue Barbette, Paris—The easy discovery of flaws and escapes in gas pipes.
905. John Sugden, Bradford—Improvements in the manufacture of combs for combing wool, silk, cotton, flax, or other fibrous materials.
907. Alfred Vincent Newton, 66, Chancery-lane—Certain improvements in fire-arms. (A communication.)
909. John Oliver, 28, Bow-lane, Poplar—Improvements in apparatus for manufacturing and conveying sulphuric acid.

Dated 2nd April, 1857.

911. George Lowry, Salford—Certain improvements in machinery for heckling flax and other fibrous materials.
913. John Frederick Wieland, Glasgow—Improvements in portable apparatus and materials for cleaning the teeth.
915. Howard Ashton Holden, Bingley Works, Birmingham—Certain improvements in carriage lamps and general carriage and harness furniture and fittings.
917. Edwin Maw, Doncaster Iron Works, Yorkshire—An improvement in the points of railway crossings.
919. Richard Archibald Brooman, 166, Fleet-street—Improvements in treating and bleaching fibrous vegetable substances, and in machinery employed therein. (A communication.)
921. Alfred Vincent Newton, 66, Chancery-lane—Improvements in repeating fire-arms. (A communication.)

Dated 3rd April, 1857.

923. William Henry Box, East Looe, Cornwall—An improved fish hook.
925. Stephen Barker, Birmingham—An improvement or improvements in the manufacture of steel.
927. Richard Archibald Brooman, 166, Fleet-street—A machine for the manufacture of bolts and rivets. (A communication.)
929. David Joy, Leeds—Improvements in steam engines.
931. Thomas Craddock, 137, Tachbrook-street, Pimlico—Certain improvements in the steam engine and steam boiler.
923. Felix Marie Baudouin, Paris—Improvements in the wires or conductors of electric telegraphs, and in the machinery for the manufacture thereof.

INVENTION WITH COMPLETE SPECIFICATION FILED.

983. Jean François Victor Larnaudès, 2, Rue Gabrielle, Montmartre, near Paris—For the disinfection and deodorisation of animal and vegetable substances.—8th April, 1857.

WEEKLY LIST OF PATENTS SEALED.

April 17th.

2419. Edward Tombs.
2421. Ferdinando Foggi.
2449. Charles Humfrey.
2450. Joseph Harrison.
2454. James Young.
2457. John Thomas Forster.
2468. Peter Armand le Comte de Fontainemoreau.
2489. Nehemiah Brough.
2498. George White.
2551. Constantine John Baptist Torassa.
2622. William Spence.
2700. Nicolas Pierre Joseph Leseure.
2948. Louis Joseph Frédéric Margueritte.
334. Henry Smith.

April 21st.

2470. William Smith.
2480. Godfrey Ermen.
2485. John Francis Porter.
2488. John Macdonald.
2490. Albert Demerit Bishop.
2491. Theophilus Horrex.
2497. Isaac Bailey.
2530. Joseph Armstrong.
2548. David H. Whittemore.
2570. Thomas Ainsley Cook.
2574. William Joseph Curtis.
2576. Samuel Tearne and George William Richmond.
2577. James Nasmyth and Robert Wilson.
2580. Eugene Napoléon Cadet.
2596. Charles Titterton.
2598. William Edward Newton.
2600. Herbert Keeling.
2609. George Collier.
2625. Louis Joseph Victor Vuitton.
2633. William Morphet.
2638. Rd. Archibald Brooman.
2657. Julian Bernard.
2674. Charles Wastell Dixey.
2680. John Kinniburgh.
2734. William Edward Newton.
241. David Yoolow Stewart.
341. James Gilroy.
454. John Henry Johnson.
473. Hector Christie.
488. Thomas Clayton.
510. John Henry Jobnson.
545. Alexander Mitchell.
547. William Wood.
555. John Henry Johnson.

PATENTS ON WHICH THE STAMP DUTY OF £50 HAS BEEN PAID.

April 13th.

871. Henry Meyer.

April 14th.

916. Frederick Buonaparte Anderson.

April 15th.

877. Frederic Barnett.
890. Julian Bernard.
891. Julian Bernard.

April 16th.

894. Henry Hucks Gibbs.
897. Jean François Felix Challeton.
924. Henry Bernoulli Barlow.

April 18th.

892. John Rowley.
935. Moses Poole.
960. Joseph Barling.

WEEKLY LIST OF DESIGNS FOR ARTICLES OF UTILITY REGISTERED.

No. in the Register.	Date of Registration.	Title.	Proprietors' Name.	Address.
3970	April 16.	Sanspareil Shirt	George Edmund Oldham	60, Mortimer-street, Cavendish-square.
3971	,, 20.	Signal Lantern	Henry James Pemberton	9, University-street, Tottenham-court-road.

Journal of the Society of Arts.

FRIDAY, MAY 1, 1857.

NOTICE TO MEMBERS AND INSTITUTIONS.

The prizes awarded by the Society's Examiners to the successful Candidates at the June Examination in London will be distributed on the morning of Tuesday, the 23rd of June, at the Society's House in the Adelphi.

The Society's Annual Dinner will take place at the Crystal Palace in the afternoon of the same day.

The Sixth Annual Conference of the Representatives from Institutions in Union with the Society, is appointed to be held at the Society's House on Wednesday the 24th of June.

The Annual General Meeting for receiving the report of the Council and the Treasurer's statement of receipts, payments, and expenditure during the past year, and also for the Election of Officers, will, in accordance with the Bye-Laws, take place at 4 o'clock on the same day.

CONVERSAZIONE.

The Society's Second Conversazione will take place on Wednesday evening, the 6th of May. On this evening the Pictures and Sketches of the late Thomas Seddon, Esq., will be exhibited, and an address will be delivered by John Ruskin, Esq. Gentlemen only are invited to this Conversazione. Cards have been issued to the members. Any member not having received his card is requested to communicate with the Secretary.

HONORARY LOCAL SECRETARY.

The following gentleman has been appointed Honorary Local Secretary:—

The Rev. J. Maxwell Weir, Leek.

TWENTIETH ORDINARY MEETING.

Wednesday, April 29, 1857.

The Twentieth Ordinary Meeting of the One Hundred and Third Session was held on Wednesday, the 29th inst., the Rev. Dr. Booth, F.R.S., in the chair.

The following Candidates were balloted for and duly elected members of the Society:—

Byron, Henry
Corthorn, Charles
Daniel, J. C., LL.D.
Devey, George
Green, the Rev. Charles Stroud, M.A.
Hiscocks, Alfred J.

The paper read was:—

METROPOLITAN IMPROVEMENTS AND THAMES EMBANKMENT.

By Francis Bennoch.

The subject on which I have undertaken to read a paper this evening is, even in its most limited sense, sufficient to chill one's enthusiasm and appal the most courageous improver; but, taken comprehensively, the difficulty is immensely increased. It is hard to resolve where to begin and what to reject, so as to touch the most important points, and bring them all within the compass of an hour's address. To treat shortly and intelligently a subject which embraces whatever relates to the health, comfort, convenience, and general well-being of two millions and a-half of people, involves no trifling responsibility. Nothing calculated to improve their condition ought to be excluded. Ventilation, drainage, sewage, public parks, baths, wash-houses, and all other sanitary regulations, whether superintended by Corporations, Royal Commissions, Boards of Works, Parish Vestries, or Local Boards, are necessarily included under the general idea of Metropolitan Improvements.

From such a catalogue of matters demanding our attention we ought not to consider as unworthy of our notice, water companies, gas companies, paving principles, or street cleansing; but as each subject enumerated possesses in itself material sufficient for a single paper, I shall content myself with cursorily touching them as I pass, and now proceed to the more immediate duty I have to perform, my purpose being to confine my remarks to such improvements in our public thoroughfares as will give increased facilities for the traffic of the metropolis.

Before proceeding to consider our streets as they absolutely exist, we will rapidly survey the past, so as to enable us more justly to appreciate the present, and partially excuse the difficulties that beset us. No people have ever been sufficiently far-seeing to anticipate accurately the wants of the future. Streets amply commodious a hundred years ago are altogether insufficient for the necessities of to-day. So short-sighted are persons in power, that before the completion of their approved designs they are frequently obliged to confess their blunder, and regret the mistake they have committed. The New London-bridge was widened considerably after the first design was settled and accepted, and had it been increased by twenty feet additional, the public advantage would have been better consulted. An idea prevailed in the City that fifty feet was ample for any first-rate street. Moorgate-street and New Cannon-street were laid down and built under that idea by the then Chairman of the Improvement Committee, in opposition to the better judgment of their eminent architect. The result is that entering Moorgate-street from the wider street beyond, is like entering a well. Prejudice ruled, and reason was left in abeyance. No first-class leading thoroughfare ought to be constructed on a scale of less than sixty feet between the houses, from front to front. Nine feet for the foot pavement on each side, and forty-two feet for the roadway. This would enable two persons to walk abreast, and allow one person to pass in each direction on each side of the street; 42 feet for the carriage way gives room for five or six conveyances; one to stand, when necessary, by the kerb on each side; one line of slow waggons and another of swift cabs to proceed in either direction. This establishes a principle that should ever be maintained. A less width is productive of many interruptions, a greater width in a street of business or general traffic might lead to confusion, but could not improve the convenience, while to cross on foot would be attended with considerable difficulty, if not absolute danger.

That the thoroughfares of London should continue as they are, is discreditable to us as an enterprising people. There is not on the face of the globe a finer situation for the metropolis of the trade, the commerce, the wealth and the luxury of the civilised world; and those who chose it displayed good sense and judgment. Never dreaming of the marvellous future they only consulted their then necessities. A sea-faring people, their highways were the rivers. Liable to attack from hostile tribes, their security was promoted by adopting a locality combining in itself the greatest number of natural advantages; the first being contiguity to the ocean, and yet with sufficient distance to render any sudden attack unlikely by day, and utterly impracticable under the shadow of night, the serpentine course of the Thames rendering navigation in the dark utterly hopeless. The second advantage was its excellent situation for agricultural and grazing purposes. The natural soil being composed of gravel and loamy clay, rendered very productive by the application of the refuse matter of large towns; the surface of the ground beautifully undulating, with a great variety of gentle hills and pleasant dells; the air temperate but moist, and innumerable springs supplying an abundance of the purest water, made and make London by nature one of the healthiest situations that could have been selected. Ascending the river, the site chosen was the first really appropriate. Though easy of approach, the banks were, nevertheless, sufficiently elevated to form a natural barrier against the encroachment of the tides.

It requires no effort of the imagination to stretch back a couple of thousand years and witness the painted natives building their tiny huts by the side of their pleasant river. Coming down the stream of time we observe them gradually change. The straggling structures increase in number, and by and bye unite to form a picturesque but irregular row of inconvenient cabins; population increased, but the banks of the river were inflexible and could not be extended, nor would it have been consistent with the habits of the times for the inhabitants to be scattered and dwelling far apart. They clustered together for mutual protection, and, therefore, another straggling row in the rear of the first appeared and formed the first street. Another and another followed, until the sides of the gentle slopes were covered with the huts of the early settlers. The space between the houses would necessarily be only such as to permit the inhabitants to pass and repass with their burdens on their heads or shoulders. When pack-horses superseded human labour in the heavier work, the streets were, no doubt, found too narrow; and, true to their nature, it is to be expected that some excited and sturdy Briton denounced the then Chief Commissioner of Works for neglect of duty. A collection of such speeches would, even now-a-days, be of rare value, when no man seems to have capacity or power enough to grasp and conquer the giant evil. The streets, then as now, followed the course of the river, narrow, winding and inconvenient. In England, Scotland, Ireland, on the continent, and even in the United States, this law holds good. The river forms the base and determines the direction of the streets.

Turnpike roads, canals and railways, those triumphs of the genius of Macadam, Brindley, and Stephenson, in facilitating the intercourse of man with man, have considerably modified the laws previously existing, and streets, straight as a line, and of admirable width, instead of being the exception, are becoming the rule. The founders of the city of Philadelphia were the first to abandon the picturesque, and determine that utility was the only rational principle that a reasonable people should adopt. But nature seems to rebel against any and every system that would attempt to fashion it into anything like perfect uniformity. The streets of Philadelphia are in their arrangements as regular and formal as the squares on a chessboard, and can, from end to end, be flushed with the crystal water of the Schuylkill every hour in the day. In seeking for improvement and perfect utility they have failed to secure uninterrupted privacy; so exactly alike are all the streets in the square, the same marble cornices, the same silver-plated handles and knockers on the doors or bell-pull knobs, the same tell-tales at either side the window, the same number of marble steps leading to the door, and the same railing around the area, that even the oldest inhabitant is liable to invade his neighbour's house. The doors are the same without, and the passages are the same within, so that a person may take off his over-coat, hang up his hat, and never discover his mistake till startled by a goddess with a shrill voice demanding what the stranger wants in her premises.

The growth of London was like the growth of the English oak—slow but sure—as if destined to live for ever; and like the oak, too, the first sign of decay was found near the centre.

The earliest reliable map gives us an idea of the metropolis 200 years ago. The old City of London, with its cathedral in the centre, seems to be a mere handful of houses when contrasted with the endless labyrinth of ways that now constitute the great metropolis. Beyond the City boundary, and outside its liberties, we had the Moorfields, Spa-fields, Conduit-fields, and the fields of Lincoln's-inn. Within a comparatively recent period, the borough of Southwark was resorted to as a place of amusement and healthy exercise for the younger men, with an occasional mansion occupied by the wealthier merchants; the custom then being for the general citizens, whatever their grade, to reside at their place of business.

Still the City grew; and grew with it all the inconveniences that marked the formation of its first street; narrow, undrained, with no free circulation of air, and with closely pent-up houses, overhanging the streets and shutting out the light. The congregation of dwellings and closely packed inhabitants became a nuisance, reeking with every imaginable abomination. Its filthiness brought its own punishment; plague and pestilence came with avenging swords, and periodically slew thousands of the people. By fasts, prostrations, and prayers, they hoped to appease offended Deity, and overcome the physical laws established by their Creator; but still the epidemic came, and all the sufferings that afflict dirty humanity could not, and would not be banished, because they neglected simple cleanliness, so near akin to godliness. At last, as a boon, and as a blessing, came the great fire of 1666; conferring on the citizens of London opportunities and advantages similar in kind, if not in degree, to those which the late famine conferred on Ireland; rendering possible for the first time in its history the introduction of a wiser system. What appeared to be a dire calamity proved to be a heavenly visitation, the commencement of a new era, the dawn of a brighter day.

Then, as now, the authorities were unequal to their position, and did not appreciate the lofty conceptions of their men of genius. Wren might unleash his imagination, and give his genius scope. Delighted with his conception, he might revel in glorious visions of a new and regenerate city rising from the cooling embers of the old, eclipsing in its grandeur and its beauty every city on the earth. But it was not to be. Red tape existed then as now, and the philosophical architect was thwarted in every possible way by the envious hand of the then illustrious Barnacle. The plan suggested by Wren for the rebuilding of the City was, of course, rejected by the authorities, and the old City was reproduced with all its evils restored or aggravated. It is humiliating to observe, that the wiser the alterations, and the greater the improvements now recommended, the nearer they approach the design of the great Christopher, to whose memory be every honour paid. The precise features of the plan suggested by Sir Christopher Wren being imperfectly known, I have caused it to be laid down on a large scale, so that you may thoroughly understand it without difficulty. That plan is now before you.

So soon as a city bursts the bonds of its commercial requirements or trading necessities, and its merchants have realised property sufficient to be independent of trade, a new condition of things appears, different streets are introduced, regulated by laws as invariable as those that existed when the first street was formed. The primary object in constructing the original houses was convenience for the purposes of gain; the second series of houses springs from the fact of accumulated wealth, and designs are produced on a scale of corresponding magnificence; the object being to gratify the senses by the indulgence of every luxury.

The first streets, as we have seen, are regulated by the course of the river; the second take an independent course. In almost every city the Eastern district is devoted to labour, the Western district to recreation and its attendant pleasures. The cause of the difference, so far as London is concerned, is perfectly clear. Begin where we will, the first house becomes the centre of the system, and as the houses increase they form a village, town, or city, and there must be to each an Eastern and a Western side. The earliest founded becomes the centre of trade producing abundant wealth. With independence arises the desire to enjoy the fruits of industry. The North may be too chill, the South too warm, the East full of bustle and vapour, but the West is during nine months in the year free from the annoying smoke which the prevailing wind kindly drifts towards the East. To the West, therefore, the man of pleasure retires, and there establishes himself. In the course of a few years he becomes the centre of a circle whose sole object in life seems to be the pursuit of enjoyment, often frivolous, and not unfrequently sinful. Though dwelling in the uncrowded West, they are nevertheless compelled occasionally, generally quarterly, to demean themselves by visiting the precincts of trade, and so a free thoroughfare is established East and West. Whatever course the streets of trade may take, the streets of pleasure are generally East and West. This is the case, not only in London, but in Brighton, Birmingham, Manchester, Leeds, Huddersfield, Glasgow, Edinburgh and Dublin; the whole being determined by the current of the wind. Mr. Glaisher, of the Royal Observatory, Greenwich, and one of our Council, has furnished me with several very elaborate tables bearing upon this point, which, I regret to say, I have been unable to use as fully as I at first intended. This, however, may prove to be an advantage to the Society, for I would suggest to our friend the propriety of his preparing a Paper for next session, to be entitled, "Which way does the Wind Blow?" I am convinced that such a Paper, founded on his almost innumerable but accurate observations, with the several principles legitimately deducible from them, could not fail to be highly interesting as well as instructive. I hope he will take the hint.

In the late autumn, the winter and the early spring, easterly winds prevail, and the western suburbs receive the smoke drifts from the east, but, at that period, the wealthy are out of town, indulging in country sports, Parliament is adjourned, while those who cannot afford the country establishment, barricade their front windows and retire to the rear, occupying the dingy chambers overlooking the stable yard of the adjoining mews, and by a strong effort of the imagination dream they are in the midst of a lively landscape. The whims and caprices of fashion are not to be understood by any process of reasoning, any more than we can reconcile with the demands of common sense, the custom that makes the period for social intercourse and friendly association, the time that should be devoted to repose, seeking our couches about the time we ought to rise—

"When night's dark curtain's drawn aside
By morning's rosy fingers."

Another reason for the streets taking naturally an easterly and westerly direction may, I think, be found in the fact that they are by necessity better ventilated; not only does the westerly wind cool and sweeten them with its refreshing breezes, but during the largest portion of the year, the rising and the setting sun illuminates and enlivens them twice every day, while the streets running north and south receive the advantage only once during the twenty-four hours. This is a matter somewhat theoretical, but, I think it is well worthy the consideration and careful investigation of the sanitary student, with the view of ascertaining whether the direction of the streets have any—and if any, what—influence on the general health of the population.

Having thus glanced at the formation of our business streets and thoroughfares leading to districts dedicated to pleasure, we must turn our attention to the examination of the difficulties to be overcome before our main trunks of communication can be considered perfect, or moderately convenient.

How to employ the industrious poor; how to get rid of the criminal population, are, and ever have been, exciting subjects for discussion. Reformatory societies, prison discipline, labour regulating, crime repressing and fraud preventing, schemes, with suggestions numberless, are spoken from the pulpit, thundered from the platform, and echoed by the press, until the very air gets thick with thoughts of something to be done. Physical discomfort and its consequent moral degradations, have attracted the attention of our Shaftesburys, our Lockes, our Rogers, and our Lethebys, and Parliament will, ere long, be forced to devise some true method of removing or abating those discreditable scenes so frequently disclosed. London is now an epitome of the universe, and contains within its borders not only all that is purest, best, most refined and holiest, but also all that is vilest, basest, wickedest and most barbarous. The several districts are divided from each other, and as accurately defined by the habits of the people, as are the several countries of the earth on a map by Wyld or Arrowsmith. Belgravia, Tyburnia, Bethnalia, and the recently discovered Rogerian district of Costermongria, are all peopled by tribes as different in their habits and modes of life, as are the Esquimaux and the loungers on a Parisian boulevard. It is no part of my intention to dive into the recesses of these several regions, and bring into light either the gems and jewels of the one, or the loathsome filth and reeking crime of the other; I leave that for abler hands. My work is to endeavour to bring these several portions of the metropolis more closely together, by suggesting certain improvements, which if adopted would render a journey from the west to the east of London, possible in less than half a day.

The difficulties of the north-west passage, the nearest route to India, the mountains of the moon, have all been measured and resolved. How to bring our Australian cousins into closer relationship, standing as we do towards each other, heel to heel with only a globe of earth between, has had due attention from the public and the legislature, but how to bring the several parts of disjointed London into closer contact by increasing the number of its bridges, widening its streets, embanking its river, or extending and rendering continuous a metropolitan belt of railways, has never to this hour, received the steady and determined attention of the authorities. A spasmodic movement is occasionally made, but with little effect. Instead of a new bridge, they construct a crutch to support the broken back of the old one. They commence a street and leave a wilderness; they attempt a sewer and produce a cesspool. We devote thousands to the evangelization of the barbarous South Sea Islanders, and leave our unfortunate brethren in an adjoining street comparatively uncared for, wallowing in hot-beds of crime, suffering, disease and death. The brightest intellects of the country and ablest engineers of the land, are devising means by which all parts of the civilized globe shall be placed in immediate contact. The harnessed lightning, obedient to our will, is delivering every moment, at every central seat of commerce, the course of Exchange on Paris, or the price of Consols in Capel Court; but how to shorten the overland route from Charing Cross to Whitechapel is left to a few enthusiastic private persons, who are, I fear, looked upon as lunatics, the matter seemingly being abandoned as hopeless, while the evil is increasing day by day.

So thoroughly has the tedious traffic of the streets become ground into the true Londoner's nature, that, to shorten his course from Piccadilly to the Bank, would be to rob him of a vested right or a natural privilege. If a railway train from Aberdeen or the Land's End arrives in London five minutes behind its time, the indignant traveller vents his spleen and writes a letter to the *Times*, but your dog-collar'd occupant of the knife-board of a Clapham omnibus, will stick on London-bridge for half-an-hour with scarcely a murmur.

Such being the result of the existing state of things, I will now direct your attention

I. To the conditions of our streets, direct and lateral.

II. To what they have to accommodate.

III. To how they may be improved.

We must first direct your attention to the communications, east and west, beginning with the river, whose ample width enables it to supply the best possible means of communication between the City and Westminster and their immediate neighbourhoods.

With all its advantages the Thames remains in a state absolutely disgraceful. The boats are the worst that sail on any river where the traffic is abundant. Our halfpenny, penny, and even our best boats are a reproach to the metropolis. They are chiefly used by the very lowest, or perhaps I ought to say the poorest or the humblest classes. As there is no respectable approach to any pier on the south side, and very few on the north, the general moving public must avoid the river until the boats are enlarged and the approaches made reputable.

Let any person examine the accommodation, and say whether it is not discreditable. Neither cab nor carriage can approach within two or three hundred yards of the piers, while the proper descents to the river by the noble stairs at London-bridge, are abandoned to other and not very creditable purposes. The pier at Paul's Chain is equally inconvenient; the one at Blackfriars is much better, and almost the only respectable landing along the river. At the Temple, Hungerford, and Westminster, are repeated the objections already named.

Leaving the river for the present, we examine the line of omnibus traffic from Piccadilly to Whitechapel; and here we must observe that the convenience afforded to traffic and facility for continuous progress must be measured, not by the maximum but by the minimum width of the streets. We all know the effect of the endeavour to empty a bottle more quickly by inverting it. A series of gurgling spasmodic efforts to escape ensue while the progress of the liquid is absolutely retarded. So with our streets. Take Temple Bar as an instance. Along the Strand the progress is steady and rapid; there is room for two or three conveyances each way, making five or six altogether. They approach Temple Bar; the two or three vehicles passing eastward are met by two or three going westward. But supposing there are only two proceeding each way, there is only room for one to pass through the Bar in each direction at the same time. The process is like drawing a wire; the two lines of traffic are drawn into one, and the result is, that carriages occupy exactly double the time they ought to do. This is obstruction the first, and the experience of all now present will confirm the fact. At Chancery-lane a stream of traffic from Camden-town to Kennington, by way of Blackfriars, swells the tide, and, meeting with contending currents in Farringdon-street, they chafe, or rather "chaff" each other, and all progress is for a while suspended. Fleet-street is blocked up; by and by that is cleared, and there is a cheerful trot round St. Paul's. A slight check is felt at the corner next to Cheapside, and a third lock takes place in the Poultry, we pass the shoals of the Mansion House, where the diverging streets are as numerous as the mouths of the Danube, and ultimately we get into the straits of Cornhill, but a fourth lock occurs in the gorge of Leadenhall; we wind through Aldgate, get into Whitechapel, and arrive at Mile-End, a distance of four or five miles in the short space of two hours and a half.

It would be interesting to arrive at the annual amount of the loss sustained by brewers, wharfingers, carriers, and proprietors of public conveyances through stoppages in the streets. An ingenious friend of mine has gone into the calculation, and come to the conclusion that, within the City boundary, what might be done in ten minutes usually occupies fifteen minutes, sacrificing one or two thousand pounds per day, or from £300,000 to £600,000 per annum; but taking the loss at £300 per day, there is a loss of £100,000 annually, an amount almost sufficient to build a bridge once a year.

Omnibuses from Hoxton, Hackney, Shoreditch, Mile-End, Blackwall, Blackwall Railway, and London Bridge Railways, all meet at the Mansion House, and must pass Cheapside in their way westward, whether they go by the Strand, or by Holborn and Oxford-street. New Cannon-street has hitherto done nothing to relieve this traffic, and only the arm of the law and the determination of the magistrate, aided by the police, will secure regulations calculated to benefit every user of public conveyances. West of St. Paul's the narrowness of Ludgate-street and Newgate-street, the latter aggravated by the crowd of butchers' carts, greatly interrupt the course of traffic, but Temple Bar on the one side, and Middle-row on the other, are obstacles which ought to be removed forthwith, as preliminary to still greater improvements.

If the direct communications east and west are in this unsatisfactory state, what can be said when we look at the lines of traffic across the river. The population occupying the area from Blackwall to the Lower-road, Islington, and on a line with Goswell-street, seeking to cross the river, can only do so by London Bridge. So in the South; the entire traffic of the district from Greenwich to Clapham, embracing Peckham, Brixton, Camberwell, and Kennington, must use the same bridge; the consequence is, that the amount of pressure at this point is excessive and unexampled. The traffic of a town is like the drainage of a country, every district supplies its tributary stream, until the accumulated mass rolls on in a mighty tide. Pursuing our course northward, we find that the next bridge having any amount of traffic is Blackfriars. Omnibuses and cabs from Islington meet at the Post-office, pass round St. Paul's or along Newgate-street, twist down the Old Bailey into Ludgate-hill, and turn into Farringdon-street, and so over the bridge to Kennington. The whole district of Pentonville, Camden-town, and Somers-town, with Tottenham-court-road as its western boundary, creep along College-street or Hampstead-road, down Gray's-inn-lane or Holborn, and get into Chancery-lane, where, like other matters in Chancery, they are kept some time. At last they turn into Fleet-street, then proceed to Farringdon-street, and on to Blackfriars. Blackfriars is, and always has been, a bad bridge, and the sooner it is rebuilt the better; its gradients are destructive to horseflesh, being about 4 feet in 100, or 1 in 25, a steepness hardly admissable on an average turnpike-road. The traffic westward seeking to cross the river, generally proceeds by way of Westminster-bridge. Southwark and Waterloo are only used occasionally, for the free British spirit rebels against a toll. The majority of men would rather drive a mile that costs a shilling than pay a halfpenny on compulsion. In practice there are only three bridges across the river open to the public, London, Blackfriars, and Westminster, their aggregate accommodation being less than one-third of the amount required. Here I may be permitted to quote a passage from a pamphlet of mine on the bridges of London:—

"Let them contrast their bridge accommodation with that of Paris. They would find that over the Seine, in a distance of four miles and a half, there were fourteen bridges, or one in 580 yards. If they added the others leading to the old city, the number would be increased to twenty-seven, all of which were free, while the population was little more than one-third of that of London. If distance should alone determine the number of bridges necessary, and if Paris were to be taken as the standard, instead of six bridges in London, they ought to have forty-two. And what still more aggravated the evil was, that between London and Westminster they had but one free bridge, and that was broken-backed. If they took Lyons, another French city, as an example, they would find that in five miles there were twelve bridges over the Saône; and in three miles and a half they had seven over the Rhône—nineteen altogether. As there the population was only 350,000, or about one-seventh of ours, if population were to be taken as the criterion for the number of bridges required to place London on a level with Lyons in that respect, there ought to be one hundred and thirty-two, instead of seven bridges."

Take one fact as an illustration of the whole matter. A person at the Post-office desiring to reach the Elephant and Castle could, had he the convenience of a high level bridge at St. Paul's, reach his destination sooner than with the present means, he can, on the average of journeys, arrive at the southern side of the river by London or Blackfriars bridges.

We abstain from further details under this head, and proceed to consider the second division of our subject.

What are the streets expected to accommodate? This portion of my address I shall give in a tabular form, so that at a glance, all who take any interest in the question, may possess themselves of facts not to be overlooked, in arriving at a just estimate of the duties to be performed. But I may here condense a few facts, worthy of being permanently fixed in the memory.

The population of London was, in—

1801	958,863	1831	1,654,994
1811	1,138,815	1841	1,915,104
1821	1,378,947	1851	2,362,236

1857, (*estimated*) 2,625,000.

Since 1801, or within 57 years, the population of the metropolis has very nearly trebled itself; and, therefore, if the streets then existing were required to be of their then capacity to accommodate the population, it follows that a population of three times the number demands a greatly increased width of thoroughfare.

Although population has increased so much, we find that public conveyances have increased in a greater ratio. The number of hackney-carriages was, in—

1801	900	1841	2,000
1811	1,000	1851	2,800
1821	1,000	1857	4,350
1831	1,200		

In the first thirty years of the present century the increase of hackney carriages was only 300, or 100 for each period of ten years, being at the rate of ten hackney carriages in a year, while during the last six years the increase has been 1,550, or over 250 per annum. Since 1801 the increase has been such as to multiply the then number nearly five times.

Before 1828, that most convenient vehicle, the omnibus, was unknown in London, being in that year imported from France by Mr. Shillibeer; yet we now observe in the public prints week by week, that one Company has a revenue of half a million sterling per annum, and the estimated capital invested in such property is nearly £3,000,000, the number of carriages under license being somewhere about 3,000.

Trade and commerce have doubtless extended in a like manner, and the number of waggons, carts, and horses must have increased proportionably. Therefore we believe we are justified in concluding that in 1857 we have ten times the number of vehicles traversing the streets that we had in 1801; and what has been done to widen the streets in proportion to this tremendous increase of traffic? Absolutely nothing!

But, it may be argued, if our population has increased as three to one, and our various conveyances as ten to one, our general metropolitan advantages have increased equal to the demand. In lodging accommodation this is undoubtedly correct, but not in our streets, giving room for arterial traffic. For, although many cabs may never—or only occasionally—enter the crowded parts to which we have been referring, nearly all the omnibuses, and nine-tenths of the carts and waggons, must visit those localities; but, estimating the increase at half what it really is, or five times the number since 1801, we repeat that unless the streets were then absurdly wide, an idea that has never for one instant been entertained, it is manifest that the main streets ought to have been nearly doubled in width.

I append tabular statements of the traffic over London-bridge taken very recently, and also the traffic of several parts of the City, taken under the superintendence of Mr. Haywood, the talented engineer to the Commissioners of Sewers of the City of London. These facts incontestibly prove the necessity for street accommodation, and it will be seen that generally the pressure is the greatest where the streets are the narrowest, or where they have not been expanded for 50 years, and cannot be widened without an enormous expenditure.

The only reasonable manner in which the evil can be overcome, and the wants supplied, is to open other currents of traffic wherever they are needed and can be accomplished. This introduces us to the third division of our subject.

How can our thoroughfares be improved? The greatest improvements in modern times were the uniform widening of the streets; the new streets opening with Leicester-square and New Oxford-street at the West-end, and within the City the construction of Moorgate-street and New Cannon-street, and above all the building of London-bridge, with its several neighbouring alterations, not only within the City, but in the borough of Southwark, and the new Victoria-street, leading from Blackfriars-bridge to Clerkenwell.

In addition to the improvement as already described of Middle-row and Temple Bar, in the communications east and west, it is indispensably necessary that something should be done to secure at least three great thoroughfares east and west, so that in the event of repairs being required in either, the other two might be always open; to meet this necessity we have on the north a direct line from Charing Cross to London Bridge, by way of the Strand, Fleet-street, Ludgate Hill, St. Paul's and Cannon-street.

The centre line should be the continuation of Cheapside, north of Paternostor-row, over Farringdon-street by a viaduct bearing slightly to the south of Lincoln's-inn Fields, and so on to meet the improvements in the west, on a line with Piccadilly.

The northern line should be New Oxford-street, a part of Holborn, diverging at the top of the hill, and by a viaduct crossing Victoria-street to Smithfield, passing in front of St. Bartholomew's Hospital, through Bartholomew's-close, across Aldersgate-street on the level, and so in a line with and into London Wall, joining the pavement for Hoxton traffic, Bishopsgate-street for Hackney or Shoreditch traffic, and proceeding down to the river side by way of Houndsditch, the Minories, and Tower-hill, crossing the river by a steam ferry; all these we show on the map now before you.

On the south side, the New-street resolved upon by the Metropolitan Board of Works, will be of immense

Table 1.

MR. HAYWOOD'S STREET TRAFFIC,

SHOWING TOTALS OF EVERY DESCRIPTION OF VEHICLE PASSING PER HOUR AND PER DAY OF TWELVE HOURS, AT CERTAIN POINTS, THROUGH CERTAIN STREETS WITHIN THE CITY OF LONDON.

In 1850.	Situation.		Hours Ending												Total of 12 hours.	Average per hour.
			9 A.M.	10 A.M.	11 A.M.	12 Noon.	1 P.M.	2 P.M.	3 P.M.	4 P.M.	5 P.M.	6 P.M.	7 P.M.	8 P.M.		
8th July	Temple-bar Gate†	4*	311	526	704	757	691	664	791	737	738	671	537	614	7741	645
9th ,,	Holborn-hill, by St. Andrew's Church	5	327	552	670	698	623	606	535	377	915	445	841	317	6906	575
10th ,,	Ludgate-hill, by Pilgrim-street	6	361	476	728	636	789	514	623	531	619	584	543	420	6829	569
11th ,,	Newgate-street, by Old Bailey	7	320	528	628	509	555	537	564	738	572	563	467	394	6375	531
12th ,,	Aldersgate-street, by Fann-st.	20	168	261	208	196	214	235	194	219	235	233	229	198	2590	215
13th ,,	Cheapside, by Foster-lane	2	473	805	1124	1169	1020	1009	1007	1076	1106	964	808	492	11053	921
15th ,,	Poultry, by Mansion-house†	3	414	762	1071	1080	1043	941	875	910	956	825	802	595	10274	856
16th ,,	Finsbury Pavement, by South-place	14	262	385	475	387	364	345	293	347	483	475	400	244	4460	371
17th ,,	Cornhill, by Royal Exchange	10	161	364	479	461	487	441	493	451	468	430	354	327	4916	409
18th ,,	Threadneedle-street	23	98	145	262	214	211	154	212	195	198	205	148	108	2150	179
19th ,,	Gracechurch-street, by St. Peter's-alley	11	258	322	439	507	392	423	464	516	461	436	338	331	4887	407
20th ,,	Lombard-st., by Birchin-lane	22	137	117	156	188	169	232	237	304	243	209	130	106	2228	185
22nd ,,	Bishopsgate-street, by Great St. Helen's	12	259	408	500	430	396	238	439	432	541	450	404	345	4842	403
23rd ,,	London Bridge	1	680	1128	1332	1124	1094	1048	1101	1180	1344	1308	962	798	13099	1091
24th ,,	Bishopsgate-street Without, by City Boundary	15	203	329	447	286	307	342	390	335	430	439	323	279	4110	342
25th ,,	Aldgate High-street, by City Boundary	13	425	422	417	442	445	379	389	409	405	401	331	289	4754	396
26th ,,	Leadenhall-street, by East India-house†	8	251	429	595	495	594	563	525	569	466	588	437	418	5930	494
27th ,,	Eastcheap, by Philpot-lane	16	335	346	398	372	378	343	368	393	398	349	294	128	4102	341
29th ,,	Tower-street, by Mark-lane	19	169	222	262	271	292	324	290	262	282	238	164	114	2890	240
30th ,,	Lower Thames-street, by Botolph-lane	24	88	130	175	105	105	108	118	147	168	121	69	46	1380	115
31st ,,	Blackfriars Bridge	9	327	381	518	516	465	336	385	416	570	548	463	337	5262	438
1st Aug.	Upper Thames street, rear of Queen-street	21	140	227	165	223	205	160	164	213	253	312	176	93	2331	194
2nd ,,	Smithfield-bars	18	203	230	202	277	276	255	334	267	328	289	288	159	3108	259
3rd ,,	Fenchurch-street	17	206	262	253	343	293	269	272	327	364	259	249	545	3642	303
			6576	9757	12208	11686	11408	10466	11068	11351	12543	11342	9757	7697	125859	10488

* This column shows at a glance the points where the traffic pressure is greatest, No. 1 referring to the largest traffic, No. 2 to the next in succession; the ascending numbers indicating diminished quantities. It is satisfactory to observe, that where the carriage traffic is largest, the pedestrian traffic is also largest; showing clearly where relief should first be given.

† The following is an account of traffic taken on Monday last, the 27th inst.:—Poultry 11,000, Temple bar 9,000, Leadenhall-street 4,800 vehicles in 12 hours.

convenience, although I think the line chosen by Mr. Pennethorne infinitely preferable.

The cross traffic of the metropolis, that is, the traffic north and south, is nearly as important as that east and west. To relieve London-bridge of much of its heaviest traffic, I suggested to a Committee of the House of Commons some years ago, the propriety of establishing steam ferries at all convenient points on the river below London-bridge, and I rejoice to find that a public company has recently been formed to carry out the project. If fairly tested and proved successful, of which I have no doubt, a new era will have commenced in regard to metropolitan thoroughfares.

Southwark-bridge, though badly-constructed, its gradients being nearly as steep as Holborn-hill, should, nevertheless be made free of toll, and Queen-street, between Cannon-street and Cheapside, made of a width equal to that between Cannon-street and Thames-street.

St. Paul's-bridge, which I had the honour to suggest, would, next to London-bridge, have the largest traffic across the river. Being on the high level, and forming the connecting link, in a straight line, between Middlesex on the one side, and Kent and Surrey on the other, it would not only relieve London-bridge, but take half the traffic that now passes over the old and ricketty Blackfriars, which, springing from the low ground, is compelled to have a very injurious gradient. Its immediate demolition and reconstruction are demanded by the exigencies of the public service. As the new bridge would be lower in the heading by four or five feet; the incline would be greatly reduced, and still

TABLE II.

Mr. Haywood's Account of Traffic on London Bridge.

22nd Oct., 1856.

Time of Day.	1 Horse.	2 Horse.	3 Horse or more.
8 to 9 o'clock...	625	191	50
9 ,, 10 ,, ...	810	359	61
10 ,, 11 ,, ...	1,090	414	70
11 ,, 12 ,, ...	1,176	390	59
12 ,, 1 ,, ...	1,083	342	40
1 ,, 2 ,, ...	1,039	378	38
2 ,, 3 ,, ...	888	357	37
3 ,, 4 ,, ...	1,027	384	40
4 ,, 5 ,, ...	1,064	436	45
5 ,, 6 ,, ...	1,048	401	53
6 ,, 7 ,, ...	750	403	46
7 ,, 8 ,, ...	550	310	38
	11,150	4,265	577

1 Horse	11,150
2 Horse	4,265
3 Horse	577
Total	15,992

more so should the piers be of stone, and the span of iron girders.

Temple-bridge would introduce a most important feature in the re-arrangement. It would open up to the river the whole district of Lincoln's-inn-fields, and the squares north of Holborn in a direct line with the south, and thoroughly ventilate the wretched neighbourhood of Drury-lane.

Waterloo-bridge should be made free of toll, and Hungerford widened and strengthened to bear carriage traffic.

TABLE III.

LONDON-BRIDGE TRAFFIC,

February 11, 1857, from 8 a.m. to 8 p.m.

	Foot Passengers.	Saddle Horses and Vehicles.
From Cannon-street to the Bridge...	5,910	2,301
From the Bridge to Cannon-street...	4,980	726
	10,890	3,027
From King William-street to the Bridge	8,430	3,310
From the Bridge to King William-street	6,957	2,564
	15,387	5,874
From the Bridge to Gracechurch-street	4,410	2,990
From Gracechurch-street to the Bridge	8,180	3,750
	12,590	6,740
From the Bridge to East-cheap......	5,580	1,160
From East-cheap to the Bridge......	2,250	1,043
	7,830	2,203
From South-Eastern and Brighton Railways to Bridge	6,700	1,158
From the Bridge to South-Eastern and Brighton Railways	8,790	1,273
	15,490	2,431
From Tooley-street to the Bridge...	10,260	1,780
From the Bridge to Tooley-street...	9,925	2,198
	20,185	3,978
From High-street to the Bridge ...	13,640	3,070
From the Bridge to High-street ...	8,170	1,740
	24,810	4,810
North side (London):		
To and from Cannon-street	10,890	3,027
,, ,, King William-street	15,387	5,874
,, ,, Gracechurch-street .	12,590	6,740
,, ,, East-cheap...........	7,830	2,203
	46,697	17,844
South side (Southwark):		
To and from High-street	24,810	4,810
,, ,, *Tooley-street	20,185	3,978
,, ,, Railways	15,490	2,431
	57,485	11,219

* The remarkable feature in this Table is, that 4–9ths of the carriage-traffic southward proceeds down Tooley-street, and that is all the heaviest traffic.

At Westminster, whether we are to have one or two bridges, I may leave to the decision of the active gentleman who presides over the department of works.

However necessary and indispensable the accomplishment of all these suggested improvements may be, all of which are carefully described on the maps before you, they only introduce me to the main object of this paper, which was designed to refer chiefly, if not solely, to the embankments of the River Thames. Having at considerable length gone into the general question of improvements, I feel that I have cleared the way for the careful investigation and discussion of the plans proposed.

You will observe from the plan before you that it combines a promenade, a carriage way, and a railway, and should the Government approve, and the River Commissioners agree to the scheme, the entire work might be executed without costing the metropolis or the country a single farthing. The revenue from the railway, and the frontage obtained from the river, would not only compensate all persons having claims, but pay, it is presumed, a handsome dividend to the projectors. The merit of the scheme, as now laid down, is chiefly due to Mr. Charles Liddell, the eminent civil engineer, to whom I am personally indebted for the beautiful drawings now before us, all executed by Mr. Driver.

You will observe that the embankment commences at Westminster Bridge, and terminates at the proposed St. Paul's Bridge. A railway you will observe starts from the Post-office, being in continuation of the Fleet Valley Railway from King's-cross; it follows the road on the embankment along the river, enters a tunnel at Whitehall, and proceeds westward to Richmond and Brentford, so as to catch the omnibus traffic of those districts which is very large, and would be exceedingly profitable.

The gardens of Whitehall, and the Temple are not only retained, but enlarged, while new gardens are to appear in front of Somerset-house. Every street coming down to the river is improved, and a greater amount of wharf accommodation secured than now exists. As time has failed me in having the whole of this plan completed, I purpose, if acceptable to the council, to return to the subject next session, when the whole scheme will be complete, architectural embellishments introduced, and when it will be divested of the incumbrance of a general idea of metropolitan improvements.

Here, however, I must explain that the railway starting from the Post Office, as already described, has

TABLE IV.

LONDON BRIDGE TRAFFIC.

February 11, 1857, from 8 o'Clock a.m. to 8 o'Clock p.m.

	Foot Passengers.	Saddle Horses and Vehicles.
North-West Corner, Up	15,730	—
North-East Corner, Up	25,750	7,410
South-West Corner, Down	16,060	—
South-East Corner, Down	28,150	7,440
The peculiar feature of this Table is its showing that along the lower or eastern side of the bridge there cross in 12 hours........................	53,900	
While along the upper or western side of the bridge there pass only..	31,790	

In comparing all these tables with others taken at earlier dates, it is instructive to observe that the increase of traffic is in perfect harmony with the increase of population.

a branch uniting it with the South Western on the one hand, while on the other it is connected with the South Eastern. Could these junctions be effected, this important and often discussed problem—how can the railways on the North and on the South of London be effectually united?—would be solved, and that in the only way that is feasible, at a moderate expense. Taking advantage of the admirable street suggested by Mr. Pennethorne, Mr. Liddell has conceived the possibility of uniting the South-Western with the Brighton and South-Eastern Railways, in a manner that cannot be surpassed. If, instead of sanctioning all sorts of peddling schemes, the authorities would resolve to grapple boldly with what is pressing and imperative, this entire scheme for Thames Embankment, Railway Junction, and a high level Bridge at St. Paul's, would not only be commenced forthwith. but completed in five years. The drawing now exhibited shows the nature of the construction. On the lowest level, facing the river. are the wharves and other matters connected with trade; on a higher level, but receding considerably, is a promenade for pedestrians; next comes the space over which, on iron columns, the railway is to be laid down; next comes the roadway for carriages, 40 feet wide, and then another footway or promenade in front of the houses that may be erected, the entire width for foot passengers, carriage way, and railway, being 100 feet.

Another line, it will be seen, might run along the side of the New-road, from St. Paul's to the Elephant and Castle, and branching off to the left, give railway convenience to the immense omnibus population of Camberwell, Kennington, Brixton, Clapham and Streatham, uniting with the Crystal Palace Railway to the west end, give facility to many visitors and considerably relieving London-bridge of much of its superabundant omnibus traffic. It will be observed further, that it is proposed to unite the Thames Embankment Railway with the Blackwall Railway, in a manner, I believe, altogether novel, the merit of which belongs entirely to Mr. Liddell.

You will see that the railway passes not only behind the houses facing the suggested new street, but absolutely passes through them; the back part of the first floor being surrendered for railway purposes. It may seem a daring scheme, but I am assured that it is perfectly practicable, and from the plan of construction proposed, it is believed that vibration could barely be detected.

The completion of the Railway and Thames Embankment scheme, would open the whole of the river from the centre of the city to the attractive west, to all who might desire to avail themselves of a rapid and regular mode of conveyance. The piers would be rendered more accessible, and so the boats would be more useful. The promenade and carriage way direct from the Bank to Charing Cross, would relieve the traffic of our present overloaded streets, while the railway would convey from St. Paul's to Westminster in a single hour a larger number of persons than could now be conveyed in twelve hours by all the appliances in general use.

No plan for the embankment of the Thames can be acceptable or will be permitted that does not secure the uniform width of the river, and provide additional convenience to the traffic on its surface. It is due to Mr. Liddell to state that all available means have been employed to accomplish these indispensable ends. The most careful surveys, patient study, and engineering skill have been devoted to the subject, and I acknowledge that although I am not possessed of a very sanguine temperament, I am nevertheless impressed with the belief that the greater portion of these suggestions will hereafter be adopted.

The amount of attention paid to the course and convenience of the London traffic, during the past few years, excites the liveliest expectation that something may be effected without any great delay. So numerous have been the schemes proposed, that one gets bewildered in thinking over them all. A considerable number, with elaborate plans, are contained in the House of Commons' Report of Evidence on Metropolitan Thoroughfares, presided over by Mr. Jackson.

Mr. Paxton's Crystal boulevard was worthy of a chapter in the "Arabian Nights," and could it be completed, would be the realisation of the most wonderful fairy tale ever promulgated.

Mr. Gisborne, Mr. Page, Mr. Bird, and others, favoured the Committee with initiative suggestions, bearing chiefly on the Thames embankment; but none, in my judgment, met so well the requirements of commerce, or of general traffic, as the plan now before us, which, when matured, and elaborated with the addition of its architectural embellishments, will be worthy of London, and that is commendation enough.

We have also Mr. Rammel's suggestions for the establishment of pillar or columnar railways, to run along our public streets on a line with the kerb-stone, which some have irreverently designated the lamp-post system. Looking at it very carefully, I fear I must conclude that it would be neither safe nor remunerative.

Mr. Mitchell, of Inverness, the distinguished engineer and superintendent of public roads in the north of Scotland, has employed a portion of his time, when visiting the metropolis, in the hope of giving some hints in furtherance of the design we all desire to see accomplished. His main suggestion is a street and railway from the front of the New Gallery near Kensington, across Hyde Park and Grosvenor-square, Regent-street, parallel with Oxford-street, and Holborn, which it crosses near Middle-row; then past the Sessions House, Clerkenwell, and uniting with the Eastern Counties Railway in Bishopsgate, the whole being nearly in a straight line from point to point.

The objection to this and to other kindred schemes is that they overlook the great pressure in the centre. The thoroughfares at the extremities suffer little if any overcrowding from superabundant traffic. The point demanding immediate attention is the central. The entire system has grown so rapidly that the streets in the City are quite incapable of accommodating the traffic forced into them. No scheme can be of any use that does not relieve the heart of the metropolis from its condition of continuous congestion. From every suburb of the metropolis, every morning, the stream of traffic sets in towards the Bank and the Exchange, and every evening the return current sets out with a force and velocity quite irresistible. Such traffic cannot be diverted, it must be accommodated; and the only rational plan is either to open up two new lines leading to and from the centre, or to widen those already in existence. The latter is next to impossible—the former is practicable and the least expensive.

How the plans suggested are to be carried out necessarily presents some difficulty, whether they must be superintended by divided or by centralized authority; whether by a Metropolitan Board of Works, or a commission, or an irresponsible dictatorship, it is not for me to determine. The annoyance increases day by day, and the difficulty of remedying it increases in a corresponding ratio. It is, therefore, manifest that the present is the likeliest time to insure success. We are to have a Commission specially appointed to the conservation and improvement of the river. We have a Board of Works, whose first duty was to attend to the perfect drainage of the metropolis, and I am of opinion that we should have a street commission, whose entire duty should be to lay down new streets, and make such improvements in the old ones as the necessity of the times demands. To do this efficiently, the Commissioners ought to be independent and free from the influences that frequently beset representative bodies, where, by clamour, isolated neighbourhoods secure the advantages of sums of money that might have been more wisely expended for the general good. Right or wrong, there is always difficulty in changing any system in this country. It is just as difficult to change from wrong to right as from right to wrong. Our nature is to venture nothing, lest all the good predicted should not be realised, and so with characteristic tenacity we adhere to all manner of absurdities and customs, having no other claim for respect than their considerable antiquity. Our river side frontage is a proof of this undeniable peculiarity. The projecting points and receding gaps irregularly alternating produce in their general aspect such an admirable disregard of either the useful or the picturesque, that I verily believe they exhibit all the defects that existed when London was first founded by our barbaric ancestors, 2,000 years ago.

Whether the plans to which I have now had the honour of directing your attention, or some others infinitely more worthy shall be adopted, I am persuaded that a tide in favour of improvement has now set in, and every contribution, however humble, tends to swell the current which, ere long, will become irresistible.

I only hope that no delay will be permitted to occur, and that most, if not all, of us may live to see the river frontage of London not only worthy of the metropolis, but worthy of the nation of which it forms a part, for it ought, in an architectural sense, to be an example to the world.

The advantage and merit of the entire scheme is, that the whole may be proceeded with simultaneously, or any part may be taken up independently. In my opinion the Thames embankment should be first proceeded with, commencing at Charing Cross. As soon as the works were completed to Blackfriars, the first important station would be established, and Fleet-street and the Strand immediately relieved. The next station would be at Old Fish-street, Cannon-street, near St. Paul's, where the works might terminate; or they might be carried on to Gracechurch-street and the Blackwall Railway, as the authorities deemed advisable.

Before resuming my seat I think it is due to Mr. Liddell as well as to myself, to say, that the plans now before you have been in course of preparation for months, and the paper I have just concluded was in the hands of the printer more than a week ago, that neither the one nor the other have in the slightest degree been modified or influenced by the report on the embankment of the Thames which has recently been published by the Metropolitan Board of Works, a report which seems to me to be exceedingly vague and inconclusive. Perhaps it would be well to give them the advantage of the plans I have now had the pleasure of submitting to this assembly.

DISCUSSION.

The CHAIRMAN said he thought it was rather a lowering reflection that in the boasted civilisation of the 19th century they should now be discussing improvements of a public character which were carried out some 2,000 or 3,000 years ago in ancient cities. The aqueducts and sewers of ancient Rome, built nearly 2,500 years ago, would probably last for centuries to come.

Dr. LETHEBY regretted that he should have been called upon to commence the discussion, because his experience in this matter was not derived from the highways of the City, but rather from its bye-ways. He could, nevertheless, add his testimony to that of the author of the paper with regard to the difficulties that existed on the eastern side of the metropolis in communicating with manufactories on the south side of the Thames. Nearly the whole of the sugar refineries were located about the neighbourhood of the Tower, and they had to make considerable journeys, not only in getting rid of the produce of their manufacture, but also in obtaining the raw material. He believed that great sanitary advantages would be derived from the proposed scheme of making a road-way along the banks of the River Thames. They knew from experience that a large portion of the fever of the metropolis was attributable to the banks of the Thames in their present condition. The miasma produced by the exposure of large surfaces of mud, at periods of the year when decomposition went on most rapidly, particularly during the summer months, infected the atmosphere. From what he had gathered from the plans before them he apprehended that there would be no dry banks of the river at all, but the stream of water would be maintained up to the edge of the road-way, and he thought that would be attended with very considerable advantages. That was one great argument in favour of the proposed plan, even if other points were left out of consideration.

Mr. WARE, as a member of the Metropolitan Board of Works, felt called upon to make one or two remarks in explanation of what had fallen from the author of the paper. That gentleman had chosen to depreciate the line of street in Southwark, selected by the Board of Works, but they had not been favoured with any reasons to show that the Board had come to an erroneous conclusion. A great deal of time and attention were devoted to this subject, and the plan of Mr. Pennethorne had been carefully considered by the Board. The architect of the Board had reported that in a portion of the line of street to which Mr. Bennoch gave the preference, there were great engineering difficulties, some of them almost insuperable. Another reason why the plan of Mr. Pennethorne was not selected was, that it was at too great a distance from London-bridge effectually to relieve the traffic of that great thoroughfare. One important point, however, had been omitted from the paper, viz., a continuation of the line of street from the docks and Whitechapel, called Commercial-street, which had its present terminus at the Eastern Counties Railway. It should have been told the meeting that it was under contemplation, both by the government and the Board of Works, to continue the line from the Eastern Counties Railway to join Old-street-road, and he (Mr. Ware) had suggested the throwing down the Charter-house wall, and thus opening out a direct communication from the east to the west. This could be effected at a comparatively small expense. The manufactures of the eastern district were required in the western, and a vast amount of benefit would, by the plan he had mentioned, be conferred upon the labouring classes, in the shape of providing them with good houses to reside in, instead of going through property of a superior description, which would have the effect of driving the present occupiers into the suburbs for residence.

Mr. EDWIN CHADWICK, C.B., said he had his own views with regard to metropolitan and other towns' improvements, but it would be impossible to enter into the consideration of so wide a subject that evening. There was, however, one practical point to which he would allude—the question of expense. It would be in the recollection of the members present that a committee of architects and others was appointed, at the instance of this Society, to examine the system adopted in carrying out public improvements in Paris. It was admitted by the members of that committee that the difficulty which lay at the foundation of town improvements of any kind was the exorbitant claims for compensation; and unless some procedure could be fixed upon to diminish the cost of litigation in such matters, there was very little hope of large and effectual operations in the way of town improvements. He looked upon the plan of Sir Christopher Wren for rebuilding the City after the great fire as a model for those who were building new towns in our colonies. It contained an element which had not been sufficiently attended to, either at home or abroad, viz., the diagonal system of streets, by means of which, a town could be more advantageously extended. He (Mr. Chadwick) had recommended to the College of Engineers, that they should make that plan their study. The loss to the public occasioned by the rejection of Sir Christopher Wren's plans on two lines of streets—one line being from Skinner-street, and the other line from Ludgate-street direct to the Bank, had been estimated at £100,000 a year, whilst the loss in a sanitary point of view was almost incalculable. The plan laid down by Sir Christopher Wren would have insured not only ventilation but drainage. It was however rejected, not by Government red tape, but by Corporation red tape. It was agreed to by the government of the time; it was approved by the Royal Society, and by all the educated classes of the community, but it was rejected by the Corporation of London, who appeared to be fearful by the spread of the population they might lose some of the subjects within their unfortunate jurisdiction. Had this plan been carried into operation the effect in his (Mr. Chadwick's) opinion, would have been to diminish the mortality of London nearly, if not quite, one third. He was emboldened to make this statement from what he knew to be the fact with regard to the rebuilding of Hamburgh. The effect of the plan adopted there had been to expel disease, and while the rich merchants formerly resorted to the suburbs for residence as most healthy, they now preferred residing in the city. With reference to the more immediate subject of the paper, there was much room for improvement in the gradients of the streets of London and in the mode of paving, and also by the adoption of tramways where practicable. He believed it was possible to save one-half the horse traffic of London, and he saw no difficulty in effecting these improvements except that to which he had alluded, viz., that of obtaining the property at a reasonable rate. They could not have a better plan than was adopted in America. When any great street improvements were carried out there, the owner of the property interfered with, was told, "If you prove that you sustain a loss we will pay you for it, but if we can prove afterwards that you have gained you must pay us." By this means the cost of public improvements had been greatly diminished.

Mr. Haywood (Engineer to the City Commissioners of Sewers) said, if he were asked what improvements were required in London, he should say, everything which had been suggested in Mr. Bennoch's paper. They wanted the Thames embanked, the present toll bridges thrown open, and a railway across the river, with thorough facilities for communication from the east to the west of the metropolis. Of all things more immediately needed, he thought the opening of the bridges was the most important as a starting point. For his own part he was glad that London-bridge was not 100 feet wide; he thought it was a fundamental error to make bridges of great width; the aim should be to separate the traffic as much as possible, and it was better to have two bridges of 50 feet wide each than one bridge 100 feet wide, as in the latter case, by concentrating the traffic into one route, even under the best regulations that could be adopted, it would at times become impeded. He should say that the best application of the public funds at the present time would be made in opening the toll bridges free to the public; they would then be able to see how the traffic distributed itself, for traffic would not be moved arbitrarily out of its ordinary channel. The next step to be carried out should be the embankment of the Thames. That he was inclined even to think should be commenced at once; it would accomplish the three-fold object of an esplanade for foot passengers, a charming drive, and a line of railway. It would also afford excellent facilities for laying down the intercepting sewer, if ever that should be carried out. Then came the question of a speedy means of communication between the City and the southern parts of the metropolis, which he apprehended could only be accomplished by carrying a railway across the river. It was calculated that in 37 years the population of London had doubled itself, and they might conceive what area would be occupied 37 years hence; and therefore, the sooner they had a railway brought through the heart of the metropolis the better and the cheaper it would be done. Mr. Chadwick had hinted at the great practical difficulty in the matter, viz., the funds. He (Mr. Haywood,) estimated that to carry out these improvements, a sum of not less than from £10,000,000 to £12,000,000 would be required. He could not agree with his friend Mr. Bennoch, that bridges across the Thames could be built for £250,000 each. The great item of expense in these cases was the approaches, where they had to deal with huge claims for compensation, a question which, he had no doubt, had entered into the consideration of the Metropolitan Board in designing the new street for Southwark. He had no doubt the amount that would be claimed by Potts, and Barclay and Perkins, would be nearer half-a-million than any other sum. The improvements in Cannon-street West had been carried out under the most economical plan that could well be adopted. They had pulled down only one side of that street, and thus they had only one set of people to compensate. The ground was sold at an enormous price; the corporation had realised the value of the ground rents, and had applied the proceeds to paying off the debt for making the street; but after realizing every farthing that was available, there still remained £800,000 lying buried in that carriage way at the present moment. After that statement he thought they would readily believe that the amount he had mentioned would be required to carry out the contemplated improvements. It was a difficulty which stopped the Government as well as the Board of Works, and Parliament rarely had the courage to vote £500,000 for public improvements, whereas the maligned Corporation had themselves built King William-street, which, in its way, was a great thing. With regard to the question of money, they went to the Continent and admired the elegant streets of Paris, Munich, and Berlin, and yet they grumbled at the idea of any sacrifice to obtain the same results in their own capital. Already there were loud whisperings in the metropolis at the idea of a sixpenny rate, but five shillings in the pound for the next twenty years would not pay for these improvements. He was not speaking too widely in stating that; and unless the metropolitan public were prepared to come down with something handsome, it was hopeless to think of carrying out these important measures. They must, however, be prepared for such a rate; unless they adopted the means employed in continental countries by establishing an *octroi*. The whole of the improvements in Paris had been mainly accomplished by means of an *octroi* upon various articles of consumption, and he contended that the funds for such purposes ought to fall equitably upon all classes of the community, and this could be effected by means of an *octroi* on some article of general consumption. He felt persuaded that the object they had in view would never be accomplished by means of a rate, but must be effected by means of an *octroi;* and for this purpose he could suggest no article of more general consumption by all classes than coals. The tax upon coals in the City of London built London-bridge, New Oxford-street, Victoria-street, and partly Cannon-street. He considered it an excellent tax. He was decidedly in favour of that tax being continued, and he hoped to see it remain in the hands of the local authorities, rather than that it should be transferred into the hands of the government. Without the slightest difficulty, and without creating the smallest disturbance, the coal tax brought in £250,000 a year, raised by a tax of 1s. 1d. per ton. The poorest members of the community scarcely felt the pressure of such an impost, and yet they paid their quota in proportion to the quantity of coal they burned in a year. If they doubled the present amount, and made it 2s. 2d. per ton, there would be an annual sum of £500,000, which could scarcely be raised from any other source with the like facility.

A vote of thanks was then passed to Mr. Bennoch.

The Secretary announced that on Wednesday

evening next, the 6th of May, the Society's second Conversazione would be held; and on Wednesday evening the 13th of May, a paper by Mr. J. B. Smith, M.P., "On the Means of Obtaining Increased Supplies of Cotton," would be read.

Proceedings of Institutions.

Exeter.—A lecture on "Comets and Cometary Astronomy," was given to the members of the Literary Society, at the Royal Subscription Rooms, on Friday, the 3rd of April, by James Jerwood, Esq., M.A., Barrister-at-Law. The lecturer gave the notions of Aristotle, Seneca, Tacitus, Cicero, Pliny, &c., as to the physical constitution of comets, and also adduced the opinions of several modern philosophers on the same point. Sir John Herschel considers them to be masses of vapour, capable of reflecting the solar rays from their internal as well as from their external parts, an inference which he thinks is rendered necessary to account for all the phenomena of comets discovered by the telescope—especially that of small stars having been seen through the largest of them. The lecturer gave many reasons to account for the singular and vague notions of the ancients respecting comets, and also why it is that our knowledge of them is still imperfect. One reason is, that there were no telescopes till the 17th century; comets, therefore, up to that time, must have been examined by the eye without any optical assistance. Another reason is, that they are visible only for a very short time, and frequently, before a comet returns, the astronomer who examined it last had passed away. Comets are usually considered to be constituted of three parts:—1, The nucleus, or densest point. 2, the envelope which surrounds the nucleus. 3, the tail. Each of these parts was explained, and the peculiarities in several comets that have appeared, were illustrated by appropriate diagrams. The lecturer gave a condensed epitome of the various effects which have been ascribed to comets, from the earliest times down to the present age, such as the war between Cæsar and Pompey; earthquakes at Lima; eruptions at Mount Etna; Great Plague in London, &c. These and a great number of other singular effects have been attributed to the influence of comets. The lecturer descanted on the palpable absurdity of these superstitious whimsies. Whiston attributed the Deluge mentioned in the Bible, to the effects of a comet; Buffon imagined that the earth and all the planets had been struck off from the sun by a comet. The lecturer, at some length, showed that these theories are altogether imaginary. Great apprehensions have been entertained that a comet would come in contact with the earth, and cause its destruction. The popular terror occasioned by Laland's Memoir, in 1773, was named as an instance. The requisite conditions which must simultaneously exist before such collision can happen were mentioned; and taking the most favourable case, in 281 millions of chances, there is only one which is favourable to a collision. Encke's comet, by its approaching nearer and nearer in each revolution, is the one most likely to bring about such a catastrophe. Olbers, however, has proved that 219 millions of years must elapse before it can happen. But, besides the great improbability of such a collision—taking the physical constitution of comets into consideration, if it should occur—it is utterly impossible that a mass of vapours, like comets, could, in the smallest degree, affect a dense body like the earth. Writers who appeared determined that comets shall bring about some terrestrial catastrophe, have expressed strong apprehensions that disastrous results will at some time happen from a comet's tail mixing with the earth's atmosphere, and, by introducing deleterious gases, render the air destructive of life, instead of being its support. The lecturer said that Sir Isaac Newton had calculated that, if all the matter constituting the largest and longest comet's tail that has been observed were to be compressed into the same density with our atmosphere, it would occupy only one cubic inch. A uniform atmosphere is about five miles high; it extends round the earth, which is twenty-four thousand miles in circumference;—if one inch of matter of the same density, however intensely poisonous, be mixed with this mass of atmosphere, the result could only be the merest particle mixed with scores of miles of atmosphere! The lecturer gave an historical sketch of several comets that are noted for the events which attended their apparition—the mode of their discovery, the splendour of their appearance, or the light which they have tended to throw on astronomical science; these comets were illustrated by large diagrams. The mode of determining the identity of a comet was explained, and the peculiarities of cometary astronomy given at some length, and also the reason why it is generally more difficult than planetary astronomy. Arago's interesting proof that comets derive most of their light from the sun was given. The last part of the lecture was a discussion on the celebrated comet called the comet of Charles 5th, which is expected to appear between this and 1860, the apprehension of its effects having excited popular terror. One of the chief objects which the lecturer had in view was to prove the utter groundlessness of the popular panic arising from the imagined effects of comets. The lecturer congratulated his countrymen that no such deplorable panic had exhibited itself in England, and expressed the hope that when the expected comet arrives they would welcome it with the interest which it claims, and regard it as a member of our system, which visited us more than 300 years ago, and that the same period might elapse before its next apparition. The unanimous thanks of the society were given to Mr. Jerwood for his interesting lecture.

MEETINGS FOR THE ENSUING WEEK.

Mon. Royal Inst., 2. General Monthly Meeting.
London Inst., 7. Mr. T. A. Malone, "On Photography; its present condition and most important applications."
Architects, 8. Anniversary.
Chemical, 8. Dr. Anderson, F.R.S., "On the products of the destructive Distillation of Animal Matter."
Entomological, 8.

Tues. Royal Inst., 3. Dr. J. P. Lacaita, LL.D., "On Italian Literature—Petrarca—Boccacio."
Civil Engineers, 8. Mr. George Rennie, "On the Employment of Rubble, and Béton or Concrete, in Works of Engineering and Architecture."
Linnæan, 8. I. Mr. Bentham, "On two new genera of Brazilian Plants." II. Rev. M. J. Berkeley, "On some new Fungi." III. Dr. Macdonald, "On the principles of Systematic Classification of the warm-blooded Vertebrata."
Pathological, 8.

Wed. London Inst., 3. Prof. Robert Bentley, "On Systematic Botany, with especial reference to the natural systems of arrangement."
Royal Soc. Lit., 4½.
Society of Arts, 8. Conversazione.
Geological, 8. Sir R. I. Murchison, "On the Silurian rocks and fossils of Norway, as described by M. T. Kjerulf, and those of the Baltic provinces of Russia by Prof. Schmidt, compared with their British equivalents."

Thurs. Royal Inst., 3. Prof. J. Tyndall, "On Sound, and some associated phenomena."
London Inst., 7. Mr. T. W. Burr, "On the History and Instruments of the Royal Observatory at Greenwich; and of other celebrated Observatories and Instruments, with the principal discoveries made by their means."
Antiquaries, 8.
Philological, 8.
Photographic, 8.
Royal, 8½.

Fri. Astronomical, 8.
Royal Inst., 8½. Prof. T. Crace Calvert, "On the Laws, Contrast, and Harmony of Colours."

Sat. Royal Inst., 3. Prof. E. Frankland, "On the Relations of Chemistry to Graphic and Plastic Art."
Royal Botanic, 3¾.
Medical, 8.

PATENT LAW AMENDMENT ACT.

APPLICATIONS FOR PATENTS AND PROTECTION ALLOWED.

[*From Gazette April* 17*th.*]

Dated 4th April, 1857.

935. John Bourne, 9, Billiter-street—The generation and application of motive power.
937. Henry Harvey and Robert Smith, 22, Surrey-street, Strand—Improvements in raising sunken ships, other vessels, and all other matters and things, from under to the surface of the water, and to prevent their sinking.
939. Elkan Adler, New York, and Francis Barber Howell, Lebanon, State of Ohio, U.S.—Improvements in machines for cleaning knives and other similar articles.
941. John Austen, 33, Rue des Martyres, Paris—Certain improvements for extracting silk and other textile and vegetable substances from the bark and leaves of every description of mulberry trees.
943. Adolphe Leclercq, Trith St. Leger, near Valenciennes—Certain improvements in sleepers of railways.
945. Richard Birkin, junr., and Thomas Isaac Birkin, Nottingham—Improvements in the manufacture of figured lace.
947. Emile Testelin, 22, Plaine St. Pierre, Ghent—A new system for the application of electricity as moving power.
949. William Sumner, Preston—Improvements in machinery or apparatus for preparing, slubbing, and roving fibrous materials.
951. John Henry Johnson, 47, Lincoln's-inn-fields—Improvements in preserving food. (A communication.)
953. James Hansor, Barnes, Surrey—Improvements in apparatus for consuming gas.
955. John James Rippon, Oakenshaw Print Works, near Accrington—A new or improved instrument or apparatus for straining or filtering colours.

Dated 6th April, 1557.

957. Thomas Melling, Rainhill Iron Works, near Prescott, Lancashire—Improvements in taps or valves, and in apparatus to prevent the overflowing of, and letting off, the water from baths.
959. George Tomlinson Bousfield, Loughborough park, Brixton—Improvements in treating india rubber and gutta percha, in order to render the same impermeable to illuminating and other gases. (A communication.)
961. Samuel Clarke, 55, Albany-street, Regent's-park—Improvements in the manufacture of candles and night lights.
963. Alfred Vincent Newton, 66, Chancery-lane—An improvement in the construction of smoothing irons. (A communication.)
965. Charles Goodyear, Leicester-square—An improved manufacture of waterproof fabric, applicable as a substitute for leather, prunella, embroidered and other ornamental fabrics and stuffs.
967. John Horace Taylor, 24, Alma-street, Hoxton—Improvements in regulating the flow of fluids.

[*From Gazette, April* 24*th*, 1857.]

Dated 17th January, 1857.

139. Charles Frederic Vasserot, 45, Essex-street, Strand—An improved paint. (A communication.)

Dated 27th January, 1857.

234. Charles Townshend Hook, Snodland, Kent—Improvements in the manufacture of paper. (A communication.)

Dated 17th March, 1857.

747. Sir Francis Charles Knowles, Bart., Lovell Hill, Berks—Improvements in the manufacture of cast steel.

Dated 21st March, 1857.

790. William Seaton, Chester-place, Regent's-park—Improvements in the construction of the permanent way of railways, and in the machinery or apparatus employed therein.
791. William Moxon and John Clayton, Bluepits, Lancaster, and Samuel Fearnley, Halifax—Certain improvements in looms for weaving, which said improvements are particularly applicable to looms for weaving carpets and other looped or piled fabrics.
792. Thomas Lawrence, Salford—Certain improvements in steam engines.
794. Henry Lafone, Liverpool—Improvements in tanning.
796. Samuel Hemming, Bow, Middlesex—A new or improved material for roofing or other building purposes.
798. Gustav Julius Gunther, John-street—Improvements in preparing blocks and stones for building purposes.
800. Matthew Augustus Crooker, New York—Improvements in paddle wheels
802. Robert Mushet, Coleford, Gloucester—Improvements in the manufacture of cast steel.
806. Edmund Hyde, Kingston-upon-Thames—Improvements in the manufacture of fabrics from products of the husks of cocoa nuts.

Dated 23rd March, 1857.

808. Louis A. Normandy, jun., 67, Judd-street—An improved process for manufacturing iron. (A communication.)
810. Thomas Nuttall, Farnworth, near Manchester—An improvement or improvements in machinery for preparing cotton, flax, or other fibrous materials.
812. Ellis Rowland, Manchester—Certain improvements in steam engines.
814. John Smith, 4, Albion-square, South side, Dalston—An improvement in applying steam or other aeriform fluids expansively in engines.
816. Jean Joseph Baranowski, Paris—An improved method of, and apparatus for, signalling upon railways.
818. Marius Chastagnon, 45, Essex-street, Strand—Improvements in tuyers for blast furnaces.

Dated 24th March, 1857.

820. James Tangye and Joseph Tangye, Birmingham—A new or improved lifting jack.
822. Thomas Young Hall, Newcastle-upon-Tyne—Improvements in steam guages and water indicators.
824. Samuel Fox, Deepcar, Sheffield—Improvements in hardening and tempering steel wire, and in straightening wire.

Dated 25th March, 1857.

826. Charles François Leopold Oudry, 4, South-street, Finsbury—Improvements in the preservation of articles of cast, wrought, rolled and forged iron, zinc, and other metals or alloys of metals against oxidation from humidity and other destructive effects of air and water.
828. Thomas Lawes, 77, Chancery-lane—A machine or apparatus to be used in cleansing, purifying, and drying animal and vegetable substances.
832. Pearson Hill, Hampstead—Improvements in machinery for stamping, marking, or printing and arranging papers, letters, and other articles.
834. Reuben Sims, Bedford, near Leigh, Lancashire—Improvements in machinery or apparatus for cutting hay, straw, and other similar substances
836. John Henderson, Lasswade, Midlothian—Improvements in the manufacture or production of plain and figured fabrics.
838. Robert Cassels, Glasgow, and Thomas Moreton, Mothewell—Improvements in the manufacture of iron.
840. Simon Martin Allaire, Paris—Improvements in manufacturing hats, caps, and bonnets.

Dated 26th March, 1857.

842. John Radcliffe, James Fearnehough, and Joseph Mather, Lancashire—Certain improvements in index machines, applicable to looms for weaving.
844. Charles Henry Baker, 7, Angel-court—Railway passengers signal alarum.
846. George White, 5, Laurence Pountney-lane, Cannon-street—Improvements in glass-furnaces. (A communication.)
848. Jean Jacques Constant Benoist, 42, Rue Jerusalem, Brussels—A new method of applying marks on paper for postal purposes.
850. Josiah Latimer Clark, 35, Adelaide-road, Haverstock-hill—Improvements in lighting coal mines.

INVENTION WITH COMPLETE SPECIFICATION FILED.

1108. Charles Barlow, 89, Chancery-lane—A mechanical apparatus for regenerating the impulsive force of any motive power. (A communication.)—20th April, 1857.

WEEKLY LIST OF PATENTS SEALED.

April 24th.

2503. Howard Ashton Holden.
2511. George Henry Bachhoffner.
2513. Henry Forfar Osman.
2529. William Armand Gilbee.
2543. William Kopke.
2599. William Clissold.
2641. Andrew Barlow.
2642. François Jules Manceaux and Eugene Napoleon Vieillard.
2668. Richard Archibald Brooman.
2677. Samuel Newington.
2706. John Billing.
2723. Richard Butterworth.
2740. Louis Adolphe de Milly.
2793. Henry Bougleaux.
2942. Frederick Wm. Anderton and Joseph Deanland.
50. Henry Bougleaux.
88. John Chanter and John Wakefield.
133. Thomas Jackson Milnes Townsend.
237. John Dangerfield.
370. Leon Talabot.
388. Thomas Fielding Johnson and John Williams
425. Frederic Henry Sykes
451. William Edward Wiley.
468. Robert Barlow Cooley.
470. John Naylor

April 28th.

2531. Samuel Russell.
2538. Louis Adolphe Faure.
2540. Thomas John.
2547. John Thomas Way.
2550. William May.
2557. John Lawson.
2562. Henry Hutton.
2564. Joseph Browne.
2568. John Parbery.
2572. Josiah Stone.
2615. James Webster.
2681. The Hon. William Erskine Cochrane.
2683. Joseph Hacking.
2687. Richard Emery.
2691. John Sutherland.
2705. George Davies.
2717. Esteves Blanchon.
2721. Samuel Cunliffe Lister.
2746. James Montgomery Gilbert
2753. Louis Dartois.
2767. Thomas Roberts, John Dale, and John Daniell Pritchard.
2805. Alfred Vincent Newton.
2817. Auguste Cellier.
2829. John Brown.
2935. Michael Burke.
3021. Robert Gibson.
99. Arnold Goodwin.
279. Isaac Holden.
281. Isaac Holden.
319. James Hamsher.

PATENTS ON WHICH THE STAMP DUTY OF £50 HAS BEEN PAID.

April 20th.

938. James Coombe.
964. John Evans.
1032. Charles Benjamin Normand
1226. Moses Poole.

April 21st.

927. Thomas Freeman Finch

April 22nd.

941. Jonathan Davidson.

April 23rd.

939. William Edward Newton.
1056. Josiah Penton and James Mackay.

April 24th.

955. John Henry Johnson.

Journal of the Society of Arts.

FRIDAY, MAY 8, 1857.

NOTICE TO MEMBERS AND INSTITUTIONS.

The prizes awarded by the Society's Examiners to the successful Candidates at the June Examination in London will be distributed on the morning of Tuesday, the 23rd of June, at the Society's House in the Adelphi.

The Society's Annual Dinner will take place at the Crystal Palace in the afternoon of the same day. Lord Stanley, M.P., will preside.

The Sixth Annual Conference of the Representatives from Institutions in Union with the Society, is appointed to be held at the Society's House on Wednesday the 24th of June.

The Annual General Meeting for receiving the report of the Council and the Treasurer's statement of receipts, payments, and expenditure during the past year, and also for the Election of Officers, will, in accordance with the Bye-Laws, take place at 4 o'clock on the same day.

EXAMINATIONS PRIZE FUND.

The following donation has been made since the last announcement :—

Titus Salt, Esq.	10 0s. 0d.

SPEECHES AND ADDRESSES OF H.R.H. PRINCE ALBERT, PRESIDENT OF THE SOCIETY OF ARTS.

At the annual dinner of the Society for the Encouragement of Arts, Manufactures, and Commerce, in the Crystal Palace, on the 24th of June, 1856, Lord Ashburton, Vice-President of the Society, in his address from the chair, observed :—"To induce the tired mechanic to study during his hours of rest, he must have some inducement beyond that of acquiring knowledge for its own sake; he must be paid for it in wages or in consideration, and that inducement he cannot hope for from ignorant employers. Prince Albert has felt this difficulty; a difficulty not within the compass of this Society to remove: and he has brought up succour to us from other quarters. He assigned to science and high art its due place in the hierarchy of society; he has encouraged our scientific and artistic institutions, but above all he has adopted that course which among Englishmen is of most avail,—he has attended our public meetings, and has in his own person appealed to us to reform ourselves. These appeals at the time produced their effect, and would continue to work upon the public mind, if this Society would in its own interest, and in the interest of the cause it espouses, print and circulate Prince Albert's addresses for our use."

At a meeting of the Council of the Society of Arts, held on the 23rd of July, 1856, the foregoing suggestion was taken into consideration, when the following minute was passed :—

"That Lord Ashburton's suggestion, to collect and publish the addresses, speeches, and letters of H.R.H. the President of the Society, having been considered, it was resolved :—That a collection be published, not at the risk of the Society, but by subscription among the members, the Institutions in Union, and the public at large, as being the best means of showing the public sense of the efforts made by his Royal Highness to promote social progress and the Encouragement of Arts, Manufactures, and Commerce, the chartered objects of the Society.

"That two editions of the collection be published under the sanction of the Society, the one a cheap edition for wide distribution, and the other a library edition.

"That members and others wishing to become subscribers be requested to transmit to the Secretary a statement of the number of copies they subscribe for, with the amount of their subscriptions."

It is proposed to publish the Library Edition at half-a-guinea, and the cheap edition at threepence each, or one pound per hundred.

Subscriptions to promote the above object will be received by the Secretary.

The following is a list of the subscribers whose names have been already sent in :—

Aberdein, Robert Henry, Honiton.
Ackroyd and Son, Halifax.
Acland, Henry, M.D., F.R.S., Oxford.
Agnew, Thomas, Manchester.
Ainsworth, Peter, Manchester.
Allenheads, Thomas Sopwith, Haydon-bridge, Carlisle.
Althorp, James, Stamford.
Amschell, Hobler, and Co., Manchester.
Armitage, Brothers, Huddersfield.
Armitage, E., Manchester.
Ashton, Thomas, Manchester.
Ashworth, Edmund, Manchester.
Ashworth, Henry, Manchester.
Ashworth, T. Spring-gardens, Manchester.
Avison, Thomas, F.S.A., Liverpool.
Baker, Charles John, 2, Bloomsbury-place, London.
Bagnall, Charles, Golds-hill, West Bromwich.
Baines, Edward, Leeds.
Bannerman, David, Manchester.
Bannerman, James S., Manchester.
Bannerman, John, Manchester.
Barbour, Robert, Manchester.
Barfam, Hugh, Manchester.
Barnett, Miss M. G., 5, Gloucester-terrace, Regent's-park.
Bates, Joshua, 21, Arlington-street.
Bazley, Henry, Cheapside, Manchester.
Bazley, Thomas, Manchester.
Bazley, Thomas Seb., Manchester.

Beaumont, John, (Dalton) near Huddersfield.
Beaumont, Joseph, and Sons, Huddersfield.
Bellhoun, D., Manchester.
Bennoch, Francis, 17, Wood-street.
Bentley, James, Cheshunt, Herts.
Bettridge, James, Birmingham.
Boileau, Sir John P., Bart., Upper Brook-street, Grosvenor-square.
Boult, Joseph, Grove-park, Liverpool.
Bradbury, Henry, Whitefriars
Bradley, William, Manchester.
Brady, Antonio, Admiralty, Somerset-house.
Brady, John, Esq., M.P., Warwick-terrace, Pimlico.
Brickwood, J. S., Upper Brunswick-place, Brighton.
Briggs, N., Bradford.
Briggs, Thos., Port-street, Manchester.
Brook, Charles, and Sons, Huddersfield.
Brook, Jonas, and Brothers, Huddersfield.
Brooke, John, and Sons, Huddersfield.
Brown, Samuel, 11, Lombard-street.
Burridge, Henry, Kirkcaldy (Provost).
Burton, Decimus, Spring-gardens.
Butterfield, William.
Butterworth, —, Huddersfield.
Callonder, W. R., Manchester.
Capes, H. N., Manchester.
Cartmell, James, Christ's College, Cambridge.
Chadwick, Edwin, Montague-villas, Richmond.
Challis, Alderman.
Chance, R. L. jun., Highfield-house, Birmingham.
Charley, William, J.P., Seymour-hill, Belfast.
Chrimes, Richard, Rotherham.
Clarke, Plummer and Co., Newcastle-on-Tyne.
Clayton, Nathaniel, Lincoln.
Clayton, Shuttleworth, and Co., Lincoln.
Clegg, T., Corporation-street, Manchester.
Clifton, R. C., Manchester.
Clowes, George.
Coleman, J. J., Norwich.
Collier, W., and Co., Manchester.
Cook, Alfred, 27, Park-street, Bath.
Cook, Charlotte Allen, 27, Park-street, Bath.
Cook, Emma Victoria Cadbury, 27, Park-street, Bath.
Cook, George Henry, 27, Park-street, Bath.
Cook, Louisa.
Cook, Robert Allen. 27, Park-street, Bath.
Cook, Robert, 27, Park-street, Bath.
Cottrell, Thomas, Esq., 50, Eaton-square.
Cowper, The Hon. W., 12, Curzon-street.
Craven, Joshua, and Sons, Bradford.
Creed, W., 53, Conduit-street, Bond-street.
Crewdson, G. B., Kendal.
Crosse, Mrs. Andrew.
Crossland, G. and Sons, Huddersfield.
Crum, Walter, Thornliebank, Glasgow.
Davies, John Birt, M.D., Birmingham.
Davis, Valentine, Furnace-house, Carmarthen.
Davison, Robert, C.E., 8, London-street, City.
Dawes, John S., Smithwick-house, Birmingham.
Dawes, Richard, Deanery, Hereford.
Dearden, W. Nottingham.
Dewhurst, Thomas, Bradford.
Dewhurst, J. and Sons, Bradford.
Dickenson, Henry, Severn-house, Coalbrookdale.
Dilke, C. Wentworth, 76, Sloane-street, Chelsea.
Dixon, Rev. J. J., Hindley, near Wigan.
Dove, Percy M., R. Insur. Com., Liverpool
Dowding, Frederick, 15, Vineyards, Bath.
Drewhurst, Geo. C., Manchester.
Durishee, York-street, Manchester.
Eastlake, Sir C. L., Pres. R.A., 7, Fitzroy-square.
Edgington, Benjamin, Battersea.
Edwards, George, Rowcroft-house, Stroud.
Ekin, Thomas, Grantham.
Elkington, Geo. R., Newhall-street, Birmingham.
Enfield, William, Nottingham.
Evill, W.
Fairbairn, Thomas, Manchester.
Fairbairn, William, Manchester.
Fairbairn, William, F.R.S., Manchester.
Fauntleroy, Robert J., Potters-fields, Tooley-street.
Fawcett, William, Clarke-house, Sheffield.
Fawkener, John, Winfield, Birmingham.
Fayolo, Andrew, Manchester.
Felkin, Thomas, Nottingham.
Fenton, J. C., Huddersfield.
Fletcher, Samuel, Manchester.
Forbes, Henry, Bradford.
Fownes, Henry, Battersea.
Fownes, Edward, Wandsworth.
Freeman, John, Huddersfield.
Gaddison, F. E., Manchester.
Garnett, J. W. and Co., Bradford.
Gifford, The Rev. Edwin Hamilton, King Ed. Sch., Birmingham.
Gillibrand, Philip, Manchester.
Gladstone, Murray, Manchester.
Glynn, Joseph, F.R.S., 28, Westbourne-park-villas.
Goldsmith, David, Bury St. Edmunds.
Graham, Peter, 37 and 38, Oxford-street.
Grey, General the Hon. Charles.
Grindrod, James N., Manchester.
Guest, John, Rotherham.
Hanhart, Michael, Charlotte-street, Fitzroy-square.
Hanson, William, High-street, Windsor.
Harrison, B., Bradford.
Hargreave, Oliver, Langley-house, Abbots Langley, Herts.
Hartley, James, Glass Works, Sunderland.
Hatherley, Henry Wright, Lawn, Cheltenham.
Hatton, James, Manchester.
Hawkes, Henry, Alderman, Birmingham.
Haymann, L., West Bridge Ford, Nottingham.
Hebbert, John B., Vice President Mid. Inst., Birmingham, 67, Hagley-road, Edgbaston.
Heelis, S. (Mayor of Salford), Manchester.
Henry, A. J., and Co., Manchester.
Henry, A. and S., and Co., Huddersfield.
Heron, Joseph, Manchester.
Heywood, A. H., Manchester.
Heywood, Oliver, Manchester.
Heywood, P., Manchester.
Hickson, Chas., and Co., Manchester.
Hickson, Charles, Manchester.
Hirth, James, Manchester.
Holland, William, 23, Mount-street.
Holmes, Herbert M., Derby.
Holmes, Messrs., Derby.
Holmes, The Rev. S., the Vicarage, Huddersfield.
Hope, Henry Thomas, 116, Piccadilly.
Horn, S. J., Manchester.
Horsfall, Thomas Berry, M.P., Liverpool.
Horsfall, William, Manchester.
Houldsworth, H., Manchester.
Howson, Rev. J. S., Liverpool.
Hoyles, Thos., and Son, Manchester.
Hume, Rev. A., D.C.L., LL.D., Liverpool.
Huth and Fisher, Huddersfield.
Hunter, J. C., Manchester.
Hunt, Robert, Museum, Jermyn-street.
Hyett, W. H., Painswick, Gloucestershire.
Jones, C. H., Huddersfield.
Jones, James, Falcon-house, Oldham.
Keingsley, Reuss, Manchester.
Keith, Wm., Cross-street, Manchester.
Kissell, George, Manchester.
Kiteley, Joseph, Kidderminster.
Knoop, L., Manchester.
Lamp, Thomas B., Manchester.
Langton, William, Manchester.
Lansdowne, Marquis of.
Lawden, Caleb, Elsbow House, Handsworth, Birmingham.
Lowe, George, Esq., F.R.S., Finsbury.

Lawrell, John George B., Esq., 7, Suffolk-street, Pall Mall.
Leather, John Towlerton, Leventhorpe Hall, Leeds.
Le Breton, Sir Thomas, Bailiff of Jersey.
Lee, Alfred, Lockwood, Huddersfield.
Lee, Tootal Broadhurst, Manchester.
Letsworth, J. C. W. Lyon, Manchester.
Levi, Leoni, 21, New Bridge-street, Blackfriars.
Leydale, John, Manchester.
Linch, Chambers, and Co., Manchester.
Lingen, Ralph R.W., 19, Gloucester-terrace, Hyde-park.
Longstaff, George D., Upper-Thames-street.
Lowenthall, Brothers, Huddersfield.
Lucy, W., Birmingham.
Mackie, Jarvie, Manchester.
Mallinson and Son, George, Huddersfield.
Manchester, J. P. (Lord Bishop), Manchester.
Martin, R., Reigate.
Mayson, John (J. I. M.), Manchester.
Mayson, J. Schofield, Manchester.
McClure, John, Manchester.
McConnel, — Manchester.
McConnell, J. H., Manchester.
Mechanics' Institution, Holmfirth.
Mechanics' Institution, Huddersfield.
Mechanics' Institution, Lockwood.
Milligan, Robert, Bradford.
Minton, Herbert, Belmont, Torquay.
Moore, John, Buckland-terrace, Plymouth,
Moore, William, Huddersfield.
Moorsom, Admiral, Euston Station.
Morris, William, Manchester.
Moss, William Henry, Hull.
Murray, Mrs., Bryanstone-square.
Myers, George, Lambeth.
Nicholls, Benjamin, Manchester.
Noyre, Walter J., Kings Lynn.
Owen, Richard, British Museum.
Pakington, Sir John, M.P., Westwood-park.
Palmerston, Viscount, M.P.
Pepper, John H., Polytechnic Institution, London.
Platt, James, Hartford-house, Oldham.
Playfair, Dr. Lyon, F.R.S., Devonshire-terrace, Notting hill.
Potter, Ed., Manchester.
Potter, Sir John, M.P., Abney-hall, Cheadle, Manchester.
Powell, Samuel, Knaresborough.
Potter, Thomas B., Manchester.
Preston, William, Vernor-street, Liverpool.
Printing Co., The Strines, Manchester.
Pryor, Edward Lyon, Manchester.
Pryor, William S., 23, Broad-street-buildings.
Pulling, The Rev. J., D.D., Master of Corpus Christi College, Cambridge.
Purvis, Prior, Blackheath.
Radcliff, Charles, Wyddington, Edgbaston.
Ramsbotham, Dr., Huddersfield.
Rand, William, Bradford.
Reiss, James, Manchester.
Richardson, Thomas, New Bridge-street, Newcastle-on-Tyne.
Rigg, Rev. Arthur, Chester.
Robinson, George, Wolverhampton.
Robinson, H., Huddersfield.
Robson, Robert, Esq., Richmond, Yorkshire.
Royal Institution, Liverpool. David Thomson, M.D., Hon. Sec., for Lit. and Phil. Society.
Ryland, Arthur, Birmingham.
Ryland. Miss, Barford-hill, Warwick.
Salisbury, The Rev. The Dean of, F.R.S., Salisbury.
Salt, Titus, Bradford.
Samen, Leopold, Manchester.
Saul, Chas. J. Booth-street, Manchester.
Sawers, John, Stirling (Provost).
Schines N. Souchargs, and Co., Manchester.
Schwabe, Adolph, Manchester.
Schwann, Kell, and Co., Huddersfield.
Shaw, Holroyd, and Shaw, Huddersfield.
Shea, John, Cork.
Shepley, Miss, Wandsworth.
Simpson, Thompson, & Co., Manchester.
Slagg, John, Manchester.
Smirke, Edward, 72, Grosvenor-street.
Smith, James Scott, Distillery, Whitechapel-road.
Spence, William, F.R.S., 18, Lower Seymour-street, Portman-square.
Spent, Wm., 6, Park-place-villas.
Spiers, Richard James, Alderman, Oxford.
Sutcliffe, W., Bradford.
Tartt, W. M., (Hon. L. Sec.) Sandford-place, Cheltenham.
Taylor, Garnett, and Co., Manchester.
Thornton, Samuel, The Elms, Highgate, Birmingham.
Tolson, James, and Son, Huddersfield.
Turner, J. Aspinall, Manchester.
Tweedale, James, Rochdale.
Twining, T., jun., Twickenham.
Twist Co., The, Oxford-road, Manchester.
Walker, Thomas, Penshire-road, Birmingham.
Wampen, Dr., 91, Upper-Ebury-street, Pimlico.
Waterhouse, John, F.R.S., Halifax.
Watkins, W., Manchester.
Watney, D.
Watney, D., jun.
Watney, John.
Watts, James, Mayor of Manchester.
Webster, John, Aberdeen (Provost).
Welsford, George Culverwell, Weymouth.
Westhead, W. B., Manchester.
Whichcord, John, Maidstone.
Whitworth, Joseph, Manchester.
Willanc, William, Huddersfield.
Willans, William, and Co., Huddersfield.
Willens, B., Manchester.
Williams, David, D.D., the Rev. the Vice Chancellor of the University of Oxford, New College, Oxford.
Williams, E., West Stockwell-street, Colchester.
Wilson, George F., Belmont, Vauxhall.
Wilson, George, Manchester.
Wilson, John.
Wilson, Mrs. W., Wandsworth.
Winfield, R. M., Cambridge-street, Birmingham.
Winkworth and Procter, Manchester.
Wolff, A. I., Manchester.
Woodcock, Henry, 70, St. Giles, Norwich.
Wood and Wright, Manchester.
Wragg, Francis, Broom-hall-park, Sheffield.
Wrigley, James, Netherton, near Huddersfield.
Wrigley, J. and T. C. and Co., Huddersfield.
Yates, Edwin, Highfield, Edgbaston, Birmingham.
Yorke, Grantham, The Rev., Birmingham.

N.B.—This list being printed from signatures, some of which were not very legible, the Secretary will feel obliged by notice of any error.

CONVERSAZIONE.

The Second Conversazione of the present Session took place on Wednesday evening last, when the pictures and sketches of the late Thomas Seddon were collected for exhibition under the superintendence of the Committee for the "Seddon Subscription Fund," and of Mr. W. M. Rossetti, the Honorary Secretary.

Several cabinet pictures of the French School from the gallery of J. Anderson Rose, Esq., were kindly lent by that gentleman. Original drawings, by M. Callow, H. Gastineau, J. D.

Harding, W. Hunt, D. McKewan, Oakley, &c., together with copies by the Chromo-lithographic process, were exhibited by Messrs. George Rowney and Company, and in many instances the copies were placed by the side of the originals, so as to show the perfection to which the art of reproduction has arrived.

Specimens of photographic miniatures, coloured in transparent colours, were contributed by Messrs. Lock, of Regent-street, and photographic portraits of Members of the present Parliament by Mr. Mayall. Some portfolios of photographs of Indian temples, &c., were contributed by the East India Company.

The plans for metropolitan improvements and the embankment of the Thames, proposed by Mr. Francis Bennoch, were examined with much interest.

In the upper suite of rooms were specimens of philosophical and mechanical apparatus, including a model of Rennie's disc engine, and the new altitude and azimuth instrument manufactured for the East India Company, by Messrs. Elliott, Brothers, as well as sets of portable apparatus for illustrating numerous electrical phenomena, by Messrs. Murray and Heath. Messrs. R. Knight and Co. exhibited the new telegraphic signal-bells invented by Mr. C. V. Walker, F.R.S., for ordinary train signalling, and for special communication in case of accident on railways.

The recording telegraph intended to be used in connection with the Atlantic cable was shown in action by Messrs. Siemens, a specimen of the cable itself being also exhibited by Messrs. Newall. Mr. Ladd, of Chancery-lane, performed some brilliant experiments with a Bentley's induction coil; and Mr. Wheeler showed his new and powerful Gas Carbon battery. The Nautilus diving apparatus, exhibited by the Nautilus Company, was shown in action.

Specimens of carving for the Sultan's new palace at Constantinople, were contributed by Mr. Rogers, as well as some photographs of Jerusalem, and a fragment of engraved marble from the Mosque of Omar.

Mr. B. Ferrey exhibited specimens of a new and simple method of producing ornamental surfaces in stucco, during the ordinary operation of plastering.

Some Paraffine Candles, obtained from Irish Peat, and affording a brilliant light, were exhibited by Messrs. J. C. and J. Field, of Wigmore-street. Pianofortes, of novel and improved construction, were exhibited by Messrs. Dewrance, Owen and Stodart, and F. Priestley. The collection of patented inventions of the past year was also thrown open.

Mr. RUSKIN delivered a most able and interesting address upon the artistic works of the late Thomas Seddon, which was listened to throughout with the most marked attention, by the large assembly. He commenced by remarking that it was no part of his intention, in appearing before them, to enter into a general consideration of the views which had actuated the formation of the committee which had been set on foot, relative to the purchase by the nation of Seddon's great picture of Jerusalem, which was now exhibited before them. There were associated in that committee men of various opinions, and of various professions, and there was such a contrast in the characters of the individuals who had united to further this object, that it could hardly be expected that he should appear before this meeting in any way as the exponent of all their various views. He might, perhaps, be allowed, in some measure, to express the views of that portion of the committee who began the movement, with whom he entirely sympathised. He believed that some objection had been taken to the idea of placing this picture in the national collection of paintings, because it was said that they sought to bring it forward as a unique picture, or as one so admirable that they were never likely to look upon such again. For his own part he differed from that view. It was not because he considered it remarkable, but because he considered it *not* remarkable, that he wished this picture to become the property of the nation; he regarded it as the type of a class of pictures and of works which might be understood and imitated by other men, and the understanding of which would be advantageous to the nation in future. In like manner it had been said that it was sought, as it were, to canonise Seddon as a saint—immortalise him as a hero—that they wished to bring forward his death as a martyrdom to the cause of painting. But it was not so. The death of Seddon had nothing remarkable or extraordinary in its character, but was merely a type of a class of deaths which were being continually offered up to the nation by great and good men, but which, in this case, a concurrence of pathetic circumstances justified them in bringing before the public notice. The simple sacrifice of life had in it nothing unusual—it was, on the contrary, a melancholy thing to reflect how continually we all of us lived upon the lives of others, and that in two ways—viz., upon lives which we take, and upon lives which are given. It was a terrible expression to use—this of taking life, but it was a true one. We took life in all cases in which, either for higher wages, or by the compulsion of commercial pressure, men were occupied, without sufficient protection or guardianship, in dangerous employments, involving an average loss of life, for which life we paid thoughtlessly in the price of the commodity, which, so far, was the price of blood. Nay, more than this, it was a well-recognized fact that there was scarcely an art or a science in the present day, in which there was not some concomitant circumstance of danger or disease, which science had not striven to abate proportionably with the endeavours to advance the skill of the workmen. And thus, though we had abolished slavery, we literally bargained daily for the lives of our fellow men, although we should shrink with horror at the idea of purchasing their bodies; and if these evils, arising partly from pressure of population, but more from carelessness and cruelty in masters and consumers, from desire of cheapness, or blind faith in commercial necessities—if these evils went on increasing at the rate it seemed but too probable they would, England would soon have to add another supporter to her shield. She had good right still to her lion, never more than now. But she needed, in justice, another, to show that if she could pour forth life blood nobly, she could also drink it cruelly; she should have not only the lion, but the vampire. These remarks applied to what was only too justly termed the taking of life; but in other cases lives were given, as by the active and enterprising explorer of unknown regions, and the brave and devoted soldier and sailor. These sacrifices we might accept, if the cause in which they were offered was a just one. He had to bring before them that evening an instance of such a sacrifice, and to explain and justify its cause.

Mr. Ruskin then graphically reviewed the progress in the art of painting from the 8th and 10th centuries up to the time of Raphael, and exhibited some of the early specimens of English art, which, by their quaintness of design and colouring, created considerable amusement amongst the audience. He also called attention to remarkable specimens around the room of the pre-Raphaelite style, tracing the development of that style by an analysis of the state of Italian art when the pre-Raphaelite principle first began to operate upon it. The whole secret of the progress of Italian art from the 8th century up to the time of Raphael, was to be found in the simplicity and truthfulness of the principle followed throughout—simplicity of principle and earnestness of purpose. Art was then unembarrassed by the disputes of critics. There was an intense religious purpose at the root of it, and an intense simplicity of approbation in the minds of the people. They received all that was done frankly, and frankly admired it. There was richness and truth in the decoration, and they never restricted their inventive genius for fear that anything might be overloaded. The richer their work was the better they liked it. They made their walls as gorgeous as they could; they innocently and always loved bright colours and beautiful forms, striving, however, chiefly to add more and more of truthfulness to their representations. It was not the pursuit of beauty that led from "The Serpent beguiling Eve" up to the Madonna of Raphael, but it was the greater accuracy of perception, and greater veracity of the lines, whch led the artist on. He need not dwell upon the powers which the Italians had, up to the 15th century, of bringing forward the greatest arts. After that period both the principles to which he had adverted were broken through. They reached the climax of power and then yielded to the abandonment of the principles which led to it. They lost their love of truth, and pursued beauty instead of it. They lost their earnestness of heart, and aimed only at amusement. Hence, in Italy an art falsely beautiful, and in Flanders an art meanly imitative. Modern pre-Raphaelitism was a reaction against both these errors. It sought veracity more than beauty; but such veracities only as were useful to mankind. Pre-Raphaelitism was simply to be defined as "the pursuit of truth in art, with a useful purpose," and one of the main advantages of its system was to bring into service minds of every class; for, in all ages, there were the two great classes of artists, men of inventive minds, and men of more or less prosaic minds; and the great danger of following the theory of beauty only, was to make the matter of fact minds comparatively useless, and yet they were the most common amongst them. There were more men capable of pursuing a simple problem, or representing a simple fact, than there were men capable of following at any distance in the path of the great inventive painters. The object of a nation should be to make all artists equally useful and happy, and to bring the gift of every man into effective service, and make his life honourable, worthy, and useful to the nation to which he belonged. The pre-Raphaelites had been regarded as one class of men only. He wished to explain to them that they were composed of two entirely separate classes. There were the poetical pre-Raphaelites and the prosaic pre-Raphaelites, and the prosaic were the more important of the two. The spirit of the present age was strictly scientific, and all that they could do more than was done in the earlier ages must be on the side of truth, and could not be on the side of imagination. The earlier times were what the brilliant, active imagination of youth was compared to the seriousness and earnestness of old age, when it was earnest—for frivolous old age was the most frivolous of all—but it was, most true that as they were aged amongst nations so they might become greater than those which had gone before them, if they brought out the peculiar character which God had impressed upon them. The peculiar power of poetry upon them at present was more or less lost from the quantity supplied. They did not want an unlimited number of poetical fancies, but they wanted a continuous advance in the knowledge of facts; and, without denying the use of all that had been done by our great poets, still they did not want an increase in the quantity of poetry. Their habits were getting more superficial in literature, because they were constantly seeking to add to the stores of imagination whilst they had not time enough to add to the stores of fact. Thus they were too much neglecting the gifts which had been bequeathed to them by their ancestors, and they would be wiser to turn their attention in some degree away from modern imagination, and preserve more perfectly that which was produced when the nations of Europe were young. Science had brought forward the disposition to test facts more accurately, which was adverse, more or less, to imagination, but which should direct to the grasping of the facts around them; and it was this special direction of painting which, he believed, ought to be cultivated. They too often wasted intellect now, by trying to make it imaginative. They might waste the life of a man by leading him to imitate the powers of another; but they could not lead one inventive mind to greater powers than it had originally, or to grasp a greater range than that which God had appointed for it; but what they could do was to prevent persons from wasting their energies, and attempting that of which they were incapable. If they imparted knowledge and industry enough, the imagination would come out. Without knowledge and industry none of those feelings would be nobly or justly expressed. The works of Thomas Seddon had to his (Mr. Ruskin's) mind arisen at a period of momentous importance to the whole of Europe. In proportion, it would seem, as nations advanced in mercantile importance, as commerce advanced, so the influential persons of all countries seemed bent upon destroying whatever stood in the way of modern improvement, and the work of destruction was going on fatally throughout France and Italy. In England it had been accomplished already, but it was taking place, in proportion to the prosperity of a country, over all Europe. Therefore it was that he was anxious that pictures in modern days should be addressed to the representation simply of facts, to the representation either of architecture or scenery of which the associations were likely to be swept away by what was called modern progress or improvement. This was the cause which the committee had it in their minds to bring before the Society of Arts on the present occasion. This cause had been advanced by many men, before the sacrifice of Seddon's life. But there was this, at least, of singular and pathetic in what Mr. Seddon had done—that he had turned away, of his own free will, from the paths of imagination to those of historical and matter-of-fact representation. They would see, on one side of the room, the noble picture "Penelope;" that was the first which Mr. Seddon painted; it was noble in every possible way; it showed inventive genius of the highest order—yet Mr. Seddon, deliberately measuring his own strength, and measuring the importance of the two tasks which lay at his choice, sternly turned from the temptations of Fancy, and set out on a journey of danger and long self-denial, in order faithfully to record the scenery of the Holy Land. Not only was Seddon peculiar in the direction which he gave to his pre-Raphaelite endeavours, but it was to be added that Seddon took a peculiar interest in the welfare of the workmen of England. Mr. Ruskin proceeded to narrate the establishment by Seddon, with the co-operation of Nevill Warren, of the first school of design in London, called the North London School of Design for workmen, in Camden-town, the principal superintendence of which devolved upon Seddon himself, conjointly with the satisfaction of the other arduous claims upon his time, attention, and hard labour. His great exertions during that period of his life, it was believed impaired his constitution, and were regarded as the primal cause of the failure of his health in Syria, and his dying there. Mr. Ruskin then entered into a recital of the labours of Seddon in his last great work of "Jerusalem," and concluded by appealing to the Society and those present to aid in doing justice to one of our greatest artists by the recognition of his genius. It was the object of the Committee to purchase for the nation, from Mr. Seddon's widow, his picture of "Jerusalem, with the Mount of Olives," and to present it, in memory of Mr. Seddon, to the National Gallery. The picture was valued at the price of four hundred guineas. A subscription for that purpose had been opened, in which all persons were invited to join who either felt respect for Mr. Seddon's genius, or desire to promote the objects to which he had sacrificed his life. What sum might remain, after the picture (poorly valued, Mr. Ruskin thought, at such a price) had been purchased, it was intended by the committee to ask Mrs. Seddon to accept; and Mr. Ruskin hoped that the Society of Arts, which had honoured him with their permission to bring these circumstances before them, would set the seal of their approval to the merit of the painter, and thus grant the only comfort which was now possible to his widow, whose sorrow must be deeper and more poignant in proportion to the greatness of the hopes she had cherished, as she watched the unfolding genius of her husband. It was for the Society now to decide, whether they would further this noble cause of Truth in art, while they gave honour to a good and great man, and consolation to those who loved him, or whether they would add one more to the victories of oblivion, and suffer this picture, wrought in the stormy desert of Aceldama, which was the last of his labours, to be also the type of their reward; whether they would suffer the thorn and the thistle to choke the seed that he had sown, and the sand of the desert to weep over his forgotten grave.

Colonel Sykes, M.P., F.R.S., moved a vote of thanks to Mr. Ruskin for his address, and announced that the collection of Mr. Seddon's works would remain open for inspection to the end of May.

The thanks of the Society are especially due to those gentlemen who, by lending the works of art and other objects of interest above mentioned, contributed so largely to the enjoyment of the members.

A FEW REMARKS ON THE ECONOMIC USES OF THE MARINE ALGÆ.

By P. L. Simmonds.

The premiums for essays offered by Sir W. C. Trevelyan, on the application of the Marine Algæ and their products as food or medicine for man and domestic animals, will, I trust, be the means of eliciting much valuable economic information in a comparatively neglected field of inquiry. The subject is one that had not been lost sight of by the Council of the Society of Arts, for in the premium list for the present year, information, I perceive, is invited as to the mode in which size from sea-weed is prepared and used by the Chinese.

Sea-weed occupies, perhaps, the largest geographical range of any known vegetable production, being found in more or less abundance wherever there is sea to nourish it. And yet, economically, it has been applied to few purposes esculent, medical, or manufacturing, and, in a chemical point of view, the fuci have been considered almost beneath investigation. Far, however, from being what Dr. Johnson terms them, "noxious and useless plants," they subserve many important purposes in the economy of nature, and might be much more generally utilized.

The natural history view of the algæ family has been investigated by several popular scientific inquirers, but no one has thought it worth while to go into any lengthened investigation of their uses to man and the domestic animals, or to consider how they might be more generally applied to economic purposes. A very valuable paper appeared recently, however, in the *Edinburgh Philosophical Journal*, by a well-known author and scientific investigator, Dr. John Davy, F.R.S., which contains some analyses and remarks well worthy the consideration of those intending to compete for the prizes offered. The experiments and researches are, however, confined to four species of sea weed common to our coasts, but they may, as Dr. Davy hopes, induce others to engage in and extend the inquiry concerning a class of substances which certainly have not yet received the degree of attention they deserve, especially from the analytical chemist.

A brief digest of their present uses, and the state of our knowledge in respect to sea-weeds, from the most reliable information, scattered over a variety of sources, may not be unacceptable in guiding the inquiries of those who have not given much attention to this interesting branch of study. In its various phases, esculent, medicinal, manufacturing, and agricultural, it requires closer investigation. The abundance of vegetation with which the All-wise Creator has stored the deep has certainly not been provided in vain, and was doubtless intended to contribute to the service of man as well as of the lower animals, and for the general economy of nature. From the limited space available in the *Journal*, I can glance but briefly at some of the varieties of sea-weed, leaving the fuller details to be filled up by those who have more leisure and facility for prosecuting the inquiry.

Dulse.—The *Rhodomenia palmata* of Greville, passes under a variety of names, dulse, dylisk, or dellish, and among the Highlanders as dullisg or water-leaf. It is nutritious but sudorific, and has a smell resembling violets. It is employed as food by the poor of many northern nations. When well washed this alga is almost tasteless; chewed—the manner in which it is commonly eaten by the peasantry of Ireland, without being dressed—it has a mucilaginous feel in the mouth, with a slight acrid aftertaste.

The Icelanders wash it thoroughly in fresh water and dry it in the air, when it becomes covered with a white powdery substance, which is sweet and palatable; it is then packed in close casks and preserved for eating. It is used in this state with fish and butter, or else by the higher classes, boiled in milk, with the addition of rye flour. In Kamschatka, a fermented liquor is produced from it.

It is consumed in considerable quantities throughout the maritime countries of the north of Europe and in the Grecian Archipelago. Cattle are very fond of this sea-weed, and sheep and deer eat it with so much avidity, that they are occasionally drowned by going too far from land in quest of it at low-water. The fronds of another sea-weed, the *Fucus vesiculosus* of Linnæus, forms a considerable part of the winter food of cattle and sheep in the Western Hebrides. It is known as seaware, and sea-wrack, and as black or swine tang. It makes good manure, and furnishes kelp. In Gothland the bladder fucus is generally given to pigs; other common species constitute a part of the fodder upon which the cattle are supported in Norway.

In Iceland the *Fucus vesiculosus* passes under the name of Doughlaghman, and of four kinds of seaweed used for food on the coast of Donegal, this species seems to be held in the greatest estimation.

To go farther from home, we find the large sea-tangle, *Laminaria potatorum*, furnishing the natives of Australia with a proportion of their instruments, vessels, and food, while other species of the same family constitute an equally important resource to the poor on the west coast of South America, and to the Fuegians, and inhabitants about the Straits of Magellan.

At a recent meeting of the Royal Society of Van Diemen's Land, samples of algæ, cast upon Sloper island, were presented and examined, which are known to yield a pure and delicious jelly, to which purpose it has been for years applied.

Growing most common, and in the greatest abundance, on every part of the earth bound by rock and washed by salt water, is a seaweed, known by the name of "Bull Kelp;" it varies in length and substance, according to its local position; it has a thick stem, and flat oval-shaped leaf, and is about the thickness of sole-leather. The aborigines of Van Dieman's Land, New South Wales, and New Zealand, and probably those of every sea-girt shore, highly prize this weed as an article of food; they estimate it, indeed, as most nutritious and palatable. Mr. Howie was first made acquainted with the nourishing properties of the "Bull Kelp" many years ago, when engaged with several aborigines on King's Island, burying the drowned people by the ill-fated ship *Catarique*, and when falling short of provisions he feared the necessity of having to return to Melbourne for a supply. The aborigines requested him to keep the provisions left for the use of himself and the white people with him; they told him they had plenty of good food—showed him the bull kelp, and explained their mode of dressing it. Mr. Howie partook of it, and has, since then, frequently for days together, lived entirely upon it. He described it as exceedingly nutritive, and even fattening.

The mode of dressing bull kelp is very simple; it is picked from the rocks, and dried in the sun; after which it is roasted. The aborigines place it on the wood embers of a fire, and keep turning it, until all parts are equally cooked; it is then soaked in fresh water for ten or twelve hours, and is fit to eat, or, being hung up and dried, may be preserved for many months. The natives carry it about with them on their journeys, and require no other description of food; they use it as we do bread, eating it by itself, or with animal food.

It is not possible to mistake any other description of seaweed for bull kelp. None other grows like it. Possessed of this knowledge, and the mode of converting it into wholesome and even nourishing food, in the event of being cast away upon any uninhabited island, in the absence of shell fish, the flesh of animals, or vegetable productions, man cannot starve; here is food attainable at all times and in all positions—presuming that he can obtain fire under all circumstances. The information cannot be too generally circulated.

TANGLE.—The leathery flat fronds of *Laminaria digitata* (Lamoroux), when young, are employed as food for both man and cattle. It is known under the several names of tangle in Scotland, red-ware in the Orkneys, sea girdles in England, and seawand in the Highlands.

The tender fronds of the young stems are eaten by the Scotch, and they are boiled and given to cattle in Nordland. The dried stalks serve in the Orkneys and Bretagne for fuel. The stems are made into knife-handles.

Laver, sloke, or slokaun (*Porphyra laciniata*, Agardh) is employed as food, salted, eaten with pepper, vinegar, and oil; another species, *P. vulgaris*, has also similar nutritious properties. This alga is much used for culinary purposes in England, under the name of Laver, in Ireland as sloke, and in Scotland as slaak. It makes a most wholesome and very palatable dish, the thin purple and green fronds being stewed. They are gathered during the winter months only, being too tough in the summer. After being properly cleaned, the seaweed is stewed with a little butter, to prevent its getting a burnt flavour, and is brought to Belfast, where, according to Mr. Drummond, it is sold by measure, usually at the rate of 5d. per quart. Before being brought to table, it is again heated with an additional quantity of butter, and it is generally eaten with vinegar and pepper. The pepper dulse (*Laurencia pinnatifida* of Lamouroux) distinguished for its pungent taste, is often used as a condiment, when other seaweeds are eaten. There was a time when the cry of "buy dulse and tangle," was as common in the streets of Edinburgh and Glasgow, as is that of "water-cresses" now in our metropolis.

Another sea-weed, growing on rocks in the sea, in deep water, passes under the various local names of badderlocks and hen-ware in Scotland, honey-ware in Orkney, and murlins, &c., in other localities. It is the *Alaria esculenta* of Greville. The stout mid-rib is eaten, when the olive green frond is stripped off. It forms a part of the simple food of the poorer classes on the Irish and Scottish coasts, in Denmark, Iceland, and the Faroe Islands. This fucus is of most rapid growth, and will spring up to six feet in length in the course of six months.

Mr. Johns (Bot. Ramb., 279) does not speak very highly of this alga as an esculent. "Being curious," he says, "to discover what kind of fern the rocks round the coast near the Giant's Causeway afforded, I stopped one of the men who was going home with his bundle, and asked him to give me a taste, prepared in the way in which it was generally eaten. He accordingly stripped off all the expanded part of a long and narrow leaf, and presented me with the stem or midrib. It was, I must confess, as good as I expected, but at best a very sorry substitute for a raw carrot, combining with the hardness of the latter the fishy and coppery flavour of an oyster. I made a very slight repast, as you may suppose, and after having given the man a few pence for his civility, continued my walk. My guide, however, seemed to think, that if I did not choose to enjoy to the full the advantage which I had purchased, there was no reason why he should not. He accordingly stayed behind for a minute or two, and when he rejoined us was loaded with a supply of the same plant, which he continued to munch with much apparent relish as we pursued our walk."

Mr. Drummond (Mag. Zool. and Bot. II., p. 148) gives a somewhat different account, both of the part which is eaten and its flavour—his observations referring to the coast of Antrim. "It is often," he says, "gathered for eating, but the part used is the leaflets, and not the midrib, as is commonly stated. These have a very pleasant taste and flavour, but soon cover the mouth with a tenacious greenish crust, which causes a sensation somewhat like that of the fat of a heart or kidney."

The long string-like sea-lace, or, as the Orkney people call it, sea-catgut, (*Chorda filum*,) is collected as food for cattle in Norway, and when twisted and dried, it possesses a strength and toughness that adapts it for fishing lines.

The broad green membranous fronds of *Ulva latissima*, (Linnæus), which have a bitterish salt mucilaginous taste, are employed as food, stewed, and seasoned with lemon juice. It bears the name of green laver, or sloke, and oyster-green.

Another nutritious alga is the dulse of the south-west of England, *Iridœa edulis* of Bory, which, according to Stackhouse, is employed as food by fishermen, either raw or pinched between hot irons; its taste is then said to resemble roasted oysters. The fronds are flat, succulent, and of a dull purple.

Under the several names of Carrigeen moss, Irish moss, pearl moss,—the fronds of *Chondrus crispus*, (Lyngb), when bleached, enter now to some extent into commerce. Containing a large quantity of gelatine, it has been successfully applied, instead of isinglass, in the making of blanc-mange and gellies. The blanc-mange thus made is hardly distinguishable from that prepared with the more costly article, and is in common use in Ireland at the tables of the opulent. This alga contains 77 or 78 per cent. of mucilaginous and gelatinous ingredients, and its gelatine even exceeds isinglass in its power of coagulating milk on cooling after boiling. According t the analysis of Dr. Davy, it appears to be composed principally of three substances; one analogous to gum, soluble in cold water, and having most of the properties of mucilage as represented by gum-arabic; one analogous to gelatine as existing in isinglass soluble in boiling water; and the third neither soluble in cold nor boiling water, the nature of which remains to be ascertained. These constituents appear to exist in the following proportions:—

28.5	Gummy matter.
49.0	Gelatinous matter.
22.5	Insoluble matter.
100·0	

Carrigeen moss is coming into use for the purpose of feeding stock, and has been employed for stiffening silks, &c. A fucus, probably allied to this, found at the Cape of Good Hope, is boiled into a jelly, and, being mixed with sugar and the juice of oranges or lemons, makes a very agreeable dish.

The *Laminaria saccharina* is interesting from the fact of its containing sugar. It is highly esteemed in Japan, where it is extensively used as an article of diet; being first washed in cold rain-water, and then boiled in milk or broth. Dr. Stenhouse obtained from it mannite, from which he manufactured an article as purely white and almost as sweet as loaf sugar.

Another fucus, the *Durvillia edulis* of Bory, is sold commonly as a table esculent in the markets of Chile.

Seaweed supplies a favourite article of food to millions of people of all classes in the Japan and the Kurile islands. The kambou of the Japanese, and the sea-cabbage of the Russians, is the *Fucus saccharinus* which is found in great abundance on the islands and shores of Eastern Asia. It is spread out upon the sand to dry, then collected together in heaps resembling haycocks, and covered with matting, until the time arrives for loading the vessels which carry it from the Kurile islands to the ports of the southern islands of Japan. It is used in soup, or, wrapped round when fish, both are boiled and eaten together. Often it is broiled on the fire; salt is strewed on it, and it is eaten without any further dressing. On some parts of the coasts of Niphon it is gathered, dried, and roasted over the coals, rubbed down to a very fine powder, and eaten with boiled rice or in soup.

EXPERIMENTS MADE BY DR. APJOHN, IN CONJUNCTION WITH DR. DAVY, IN JULY, 1854.

		Nitrogen Per Cent.
Specimens supplied by Dr. Davy, and dried at 212.°	*Chondrus crispus*, bleached	2.152
	Fucus vesiculosus..	2.379
	Rhodomenia palmata (Dylisk).	3.776

EXPERIMENTS MADE BY DR. APJOHN, IN AUG. 1854.

—	Water.	Dry Matter.	Per cent. of Nitrogen in Dry Matter.	Protein contained in Dry Matter.
Chondrus crispus, bleached, from Bewly and Evans	17·92	82·08	1·534	9·587
Chondrus crispus, unbleached, Ballycastle	21·47	78·53	2·142	13·387
Gigartina mammillosa, Ballycastle	21·55	78·45	2·198	13·737
Chondrus crispus, bleached, Bewly and Evans, 2nd expt.	19·79	80·21	1·485	9·281
Chondrus crispus, unbleached, Ballycastle, 2nd expt.	19·96	80·04	2·510	15·687
Laminaria digitata, or Dulse Tangle, Ballycastle	21·38	78·62	1·588	9·925
Laminaria digitata, or Black Tangle, Ballycastle	31·05	68·95	1·396	8·725
Rhodomenia palmata, or Dylisk, Ballycastle	16·56	83·44	3·465	21·656
Porphyra laciniata, or Levre, Ballycastle	17·41	82·59	4·650	29·062
Iriæa edulis, Ballycastle	19·61	80·39	3·088	19·300
Alaria esculenta, or Murlins, Ballycastle	17·91	82·09	2·424	15·150
Means	20·42	79·58	2·407	15·045

N.B.—The amount of water given in this table is considerably less than what belongs to the algæ when fresh from the sea, for they had all undergone a partial drying preparatory to being sent up from Ballycastle to Dublin for analysis.

That these seaweeds are deserving of the reputation which they have amongst the poor, to whom their use as articles of food, with one or two exceptions, is chiefly restricted, and most of all in Ireland, is in a manner demonstrated by the results of the experiments of the able chemist I have just quoted, and on whose accuracy the most perfect reliance may be placed. Dr. Apjohn, in an interesting lecture which he delivered at a meeting of the Royal Agricultural Society of Ireland, and since published in that Society's Journal, has given some account of these experiments.

PER-CENTAGE OF NITROGEN IN VARIOUS EDIBLE SUBSTANCES DRIED AT 212.°

Potatoes	.541
Flour of first quality	1.817
Beet roots (mean of 13 experiments)	1.848
Mangolds (mean of 3 experiments)	1.781
Swedish turnips (mean of 5 experiments)	1.843
Means	1.567

These results are so unexpected, that could there be any doubt (which I have not) of their accuracy, it might be questioned. The mean of them shows that the proportion of nitrogen these alga contain, exceeds that not only of the ordinary articles of vegetable food, but even that of wheaten flour of the first quality, being as 2,407 to 1,317.

CORSICAN MOSS.—Properly this consists of a species of *Plocaria*, *P. Helminthochortos* of Nees. It is the *Gracilaria Spœrococcus*, or *Gigantina Helminthochortos* of others. As sold in the shops this so-called moss consists of various marine productions, especially of *Laurencia obtusa*, with a very little *Plocaria* intermixed. It is obtained on the coast of Corsica, and elsewhere in the Mediterranean, and is nutritious, strong scented, and was formerly held in repute as a vermifuge.

Plocaria tenax, the *Spœrococcus*, or *Gracilaria tenax* of other authors, found in the Eastern seas, has a gelatinous frond, and, from its glutinous, nutritious properties, is used for soups and jellies among the Chinese, and also as size and gum. It is imported in large quantities into Canton, from the coasts of Fo-kein and Tchekiang, and is believed to be the chief ingredient of the Chin-chin glue.

The CEYLON MOSS, *Gigartina lichenoides*, is a small and delicate fucus, of white colour and flattened filiform shape, and contains about 70 per cent. of starch and vegetable jelly. Prepared with milk and sugar, and flavoured by lemon juice or sherry, it would afford the invalid a pleasant article of diet at sea, where other jellies or their materials cannot be so easily preserved.

AGAR-AGAR.—This is the Malay name for an alga, which has long been an article of commerce in the Eastern seas, and is extensively imported into China. When boiled with sugar it forms a sweet jelly, much resembling that made from calves' feet, and is highly esteemed, both by Europeans and natives, for the delicacy of its flavour. Its cheapness and admirable qualities render it worthy of greater attention as an article of trade.

The bamboo-lattice work for lanterns in China is covered with paper, which, when saturated with this gum, is semi-transparent. It is also used in the manufacture of silk and paper, and is preferable to flour for making paste, as insects avoid it.

Agar-Agar is prepared at Malacca, in the shape of a clear jelly, which is much admired. The plant is found on the rocks at Pulo Ticoos, and on the shores of the neighbouring islands. It is blanched in the sun for two days, or until it is quite white. It is obtained on the submerged banks in the neighbourhood of Macassar Celebes, by the Bajow-laut, or sea-gipsies, who send it to China. It is also collected on the reefs and rocky submerged ledges in the neighbourhood of Singapore, and constitutes the bulk of the cargoes of the Chinese junks on their return-voyages. There are two or three qualities, ranging in price from 12s. 6d. to 30s. per 1¼ cwt.

The Ceylon moss, *Gracellaria* (*Gigartina*) *lichenoides*, a small and delicate fucus, is also of a gelatinous nature, and after being washed in fresh water, and pressed to remove the salt and some mucilage, it is employed as a preserve.

Some of these seaweeds are probably used by the Salangana, or esculent swallows, in constructing their nests, which are esteemed so great a food delicacy by the Chinese.

A seaweed not described, but passing locally under the name of Akar jong barellah, is eaten by the Malays, the fronds being dressed with curry.

Occasionally species of *Nostoc* are eaten in the East. In a communication made a year or two ago to the Bombay Branch of the Asiatic Society, specimens of *Nostoc collinun* were sent by Mr. Frere from Shikarpoor, which were found pretty thickly strewed over a space of two or three square miles, after a shower of rain, in the month of May, 1855. The natives described it as a shower of gosht (meat), which they say it resembled, being, when fresh, of a soft pulpy consistence, and like flesh in colour.

It was an alga, not far removed in the vegetable kingdom from the seaweeds which are frequently boiled down into a jelly for food; and in China, as well as in some other countries, certain species of *Nostoc* are commonly eaten. The Scindians were, therefore, not far wrong in calling it gosht, or meat; and from the inconceivable smallness of the germs from which it is first generated, like the green which makes its appearance over objects that have never been exposed to the monsoon, yet present this colour a few days after it has commenced, the germs of this *Nostoc* might have been brought through the air to the place where they at the appointed time for their germination passed into visible forms, which having no earthly origin that the ignorant Scindians could conceive, and coming into tangible masses just after a storm, not unnaturally led to the conclusion, that they must have been showered down from the heavens. Happily, many of these events which appear miraculous to the ignorant, and give rise to scepticism among many at the present day, because they are not understood, derive explanations from science which defy all attempt at disbelief. It is wonderful to the Scindian to see what he can only conceive to be a substance rained from heaven; it is no less wonderful to the naturalist, who can trace this substance to its germs, to wonder even still more how the first germs were generated which uninterruptedly and unerringly goes on producing its like. Thus does the Creator keep up his power of eliciting wonder and admiration from the most ignorant to the most learned.

Everywhere, where sea-weeds are easily obtained, they are in repute as manure. Their fertilizing powers are quite in accordance with their composition, the large proportion of azote and the considerable portion of the inorganic substances which they contain, and which are equally the elements of our cultivated crops, especially phosphate and carbonate of lime, and one or both of the fixed alkalies.

The Duke of Hamilton assigns to each of his tenants in the Isle of Arran, a portion of the sea-shore to collect seaweed. In Ireland this is the chief fertilizer for thousands of acres of potatoe land.

The great demand for this manure, the high prices it brought, and the great breadth of ground devoted to potato-planting last season, may be inferred from the fact, that it is computed by those who have had the best opportunities of forming an accurate estimate, that the large sum of £10,000 has been paid for seaweed at the Galway docks alone. If we take into account the quantities which have been disposed of at Oranmore, Kinvarra, Ballyvaughan, Barnas and the other creeks and landing-places within the bay, the cutting of seaweed this season must have realised upwards of £13,000. It has been conveyed to a considerable distance, by boats along the lakes, by carts on the road, and even by railway. Perhaps in no former year has the use of it been more general, or the price paid for it so high, as in the present season.

In the Channel Islands the season for cutting seaweed is fixed by law, and it is not only used for manure, but serves also to some extent as a fuel, and makes a hot if not a cheerful fire. There is no reason why decomposed and concentrated seaweed might not be made a valuable fertilizer. Almost all the seaweeds yield soda and iodine on incineration. Until very recently they have been collected in large quantities and burned for the sake of the soda yielded by the ashes; after separating the alkali, iodine was obtained from the mother liquors. Although the trade in kelp has been nearly annihilated by the plan of making soda from common salt, still seaweed ashes constitute the sole source from which iodine is manufactured.

To sum up, in the words of Dr. Davy, are not these esculent sea-weeds, on account of the iodine and bromine which they more or less contain, deserving of more general use? Nowhere, I believe, where they are in common use is bronchocele known; and, as far as I have been able to ascertain, scrofulous complaints are rare and even pulmonary consumption; whilst on the contrary, in inland districts, even in our own country, bronchocele and scrofula are more or less prevalent, especially amongst the labouring class, who rarely have the benefit of articles of food known to contain iodine. And this remark applies to our troops, whose dietary hitherto has been regulated with such a marked neglect of medical science.

In relation to use, these vegetables have for the most part the recommendation of cheapness, so as to be within the reach of the poorest; and their not being liable to spoil by keeping when dried, is also a circumstance in their favour; and another, I may add, is that they are grateful to the palate, and some of them—dulse, for instance—even in their undressed state.

8, Winchester-street, Pimlico.

EXAMINATIONS.

The following letters have been addressed to Dr. Jeune, the Master of Pembroke College, Oxford, by the Rev. F. Temple, one of the inspectors of schools, and late head of Kneller Hall training school:

"TO THE MASTER, PEMBROKE COLLEGE, OXFORD.

"8, Royal-crescent, Notting-hill, London,
April 17, 1857.

"My dear Master,—I promised to put on paper the substance of the conversation which I had with you in Oxford a little time ago on the subject of middle-class education.

"The education of the middle classes suffers at present from the want of any definite aim to guide the work of the schoolmasters, and from the want of any trustworthy test to distinguish between good and bad schools.

"That the result is unsatisfactory, all who know anything of the matter agree in proclaiming. It is constantly said, and said with truth, that many national schools now give a better education than can be obtained at schools of much higher pretensions. The masters in the national schools know precisely what they are expected to do, and know that the government inspection will also invariably in the end bring into clear light whether or not they have done it. The masters who now teach the middle classes have no means of knowing either the one or the other. They are, speaking generally, expected to prepare boys for what is called business. Now this is so vague an aim that they may well be forgiven if they miss the proper means to reach it; but even if they so thoroughly understand their duties as to give precisely what is wanted, they have no means of convincing the parents of their pupils that they are doing so. In not a few instances the parents are misled into preferring what makes a show to what is really useful; and I have known a case where a very efficient master was driven away by the competition of one in every way his inferior, simply because the latter taught a showy but quite useless kind of penmanship. In all cases the plausible puffer has a most unfair advantage over the thorough teacher—an advantage which would instantly disappear if the work of the two were brought to any real test.

"This neglected condition of the education of the middle class becomes more striking when contrasted with the great efforts made to improve the education both of those above and those below that class. The universities, which have been to a great extent occupied by the upper class, are actively engaged in improving their systems. The government has spent two millions and a half upon the lower class, and is still spending at the rate of half a million a year. But nothing whatever is done for those who lie between.

"And this neglected class has a very wide range, including many who are socially on a level with some of those who enter the universities, and a few of the more active-minded among those who are taught in our national schools. Here are to be found without doubt the great body of our voters, of our tax-payers, of our rate-payers. It is obviously wrong to leave them out of sight when speaking of the education of the country.

"The remedy is, I believe, in the hands of the universities. If Oxford and Cambridge were to undertake the task of guiding and testing the instruction given in the schools of which I am speaking, I am confident that their guidance would be gladly accepted, would speedily remedy the evils that I have described, would confer a great benefit on the country, and would re-act most beneficially on the universities themselves by increasing their popularity and the general sense of their value.

"I do not think any very complicated scheme is needful for this purpose. What I should propose would be this:—

"That the university should confer some such title as Associate in Arts on every person who passed an examination before examiners appointed either by the hebdomadal council or by a delegacy, as might be thought best.

"This examination should pretty nearly follow the precedent set by the Final Schools. An examination of a somewhat similar kind to what I am proposing is to be tried in Devonshire this summer, at the suggestion of Mr. Acland. He has planned his examination on the present Oxford Final Schools, and the way in which it has been welcomed by the classes for which it is intended proves that it suits their case. There is, moreover, an obvious advantage in the university's following a university precedent.

"I should propose, then, a scheme of examination somewhat of this kind:

"1. A preliminary examination in

"(*a*) Writing from dictation, arithmetic, parsing, and elementary geography.

"(*b*) Religious knowledge (if the parents of the candidates desire it).

"2. Four Schools—

"(*a*) School of English, to include English literature and composition, English history, the rudiments of political economy, and geography.

"(*b*) The School of Languages, to include French, German, and the elements of Latin.

"(*c*) The School of Mathematics, to include practical mathematics, architecture, and drawing.

"(*d*) The School of Physical Science, to include the elements of mechanics, chemistry, and physiology, and the sciences connected with them.

"Two standards should be fixed, one for boys of 15, the other for boys of 17. The title of Junior Associate should be given to those who pass the former, that of Senior Associate to those who pass the latter.

"Every candidate should be required to pass the preliminary examination and one school.

"A class list for each school should distinguish those who did really well from those who merely passed.

"The expense of paying the examiners should be covered by requiring a fee of about 5s. for admission to the examination, and another of about 2s. 6d. for the testamur.

"The examinations should be held annually in Oxford. But if the gentry or local authorities of any place asked for an examination to be held in their neighbourhood, and would undertake to bear the expense of the necessary arrangements, an examiner should be sent down to them.

"The examination should, I think, be all on paper, and the same examination papers used everywhere at once.

"Now, such a scheme as this would not be at all difficult to work. It would give a definite aim and a powerful stimulus to all the education of the middle class, and it would probably bring within its operation many even of the higher class, who now enter professions where an academical degree is not wanted, but whose parents would be glad to have the school work of their boys authoritatively tested, if it could be done without the expense of a university education.

"The objection which occurred to your mind when I spoke on the subject, was a doubt whether candidates would present themselves. On that point I have no doubt; but I have been communicating on this point with several persons interested in education, and in a few days I will write again and tell you the result of my inquiries.—Yours, &c.,

"F. TEMPLE."

"8, Royal Crescent, Notting-hill, London, W., April, 24.

"My dear Master,—I promised in my last letter that I should write again and state some of the grounds on which I believed that such a scheme of examination as I described would be generally welcomed by those who are concerned in the education of the middle class, and would not fail for want of candidates to be examined.

"I rely chiefly on the fact that plans of this sort have sprung up spontaneously in many different places, and have in every case proved successful; much more successful than could have been anticipated from such merely local attempts, backed by no commanding authority, and relying simply on the existence of a need strongly felt.

"Of these schemes of examination the best known is that commenced last year by the Society of Arts. In 1852 that Society, at the suggestion of Mr. Harry Chester, proposed to the various Mechanics' Institutes scattered over the country, that they should affiliate themselves to the society as a sort of centre of union. This was very generally agreed to, and between 300 and 400 of those bodies entered into the proposed union, and while, by this means, the institutes gained a centre, the society gained a means of acting very widely on the country at large. In 1854, at the suggestion of the same gentleman, the Society proposed to hold examinations for all members of these Institutes, and to grant certificates of competency in a great variety of subjects to all who passed the examinations. The first examination was held in London last June, with complete success. I was myself one of the examiners. Fifty-two candidates presented themselves, and the majority obtained certificates. This year a similar examination will be held in two places, London and Huddersfield. We do not yet know the number of candidates, but we do know that it will be very much larger than last year. Nor is the number that will come, any measure of the number that desire to come. For the Society was repeatedly pressed to hold examinations in other places, and only refused for fear of breaking down by attempting more than its organisation, not originally adapted for such a scheme, would allow.

" This scheme, you will observe, though excellent in many ways, does not cover the ground which I am anxious that Oxford should occupy. The Society of Arts examines members of Mechanics' Institutes, and the examination is planned with a view to adults. An adult, if he is to study, would generally succeed best by keeping to a single subject; and accordingly the Society's examinations are broken up into a great number of separate divisions; a man may be examined separately in history, or in English literature, or in geography, or in chemistry, and so on. It is obvious that this is not the best way in which to test the work of schoolboys, and, indeed, the Society of Arts expressly excludes boys at school from examinations.

" Boys at school are, however, precisely those whom the University may most properly make the object of its care. The University may very properly do what the Society of Arts could not arrogate the right of doing, namely, offer to guide all the schools in their work, and to stamp that work with authoritative approval. And I have no doubt that the same reasons which brought so many candidates to the examinations of the Society of Arts will bring very many more to the examinations of the University of Oxford. None, I think, but University residents are unconscious of the high *prestige* which the University enjoys in the country at large, or how very eagerly any title would be sought which implied connection with Oxford or Cambridge. The first remark that has been made to me by numbers of persons to whom I have described the plan, has been, ' If the University will do what you propose, my boy shall go in for the examination.'

" The examinations held by the Society of Arts are the best known. But there are other schemes of the same kind in operation. One which has been planned by Mr. Acland, for examining boys destined for arts, manufactures, agriculture, or commerce, in the West of England, very nearly represents in its most important features what I wish to see taken up by the University, and extended to the whole country. It is intended for schools, not for Mechanics' Institues, and it groups the subjects of study nearly as I have done, following, in fact, the precedent of the Oxford final examinations. The proposal was not made public before Christmas, and it offers few inducements, except a certificate of success, to bring candidates within its range. But it has been generally welcomed; more than thirty schools have already announced their assent to it, and nearly a hundred candidates have declared their intention of being examined,

" Mr. Acland's machinery is a local board of examiners, with the aid of two inspectors from the Committee of Council; but he intended his proposal to be followed up, either by the government or by some other authority. He would gladly see it replaced by the action of the university. And the thirty schools that have agreed to send boys to be examined by Mr. Acland's local board, would certainly be at least equally ready to send them before a board representing the authority either of Oxford or Cambridge.

" At the same time that Mr. Acland was applying to the Committee of Council for aid in working his project, another somewhat similar application was made by the Hon. and Rev. S. Best, on behalf of a board of education in Hampshire.

" This application was refused on some technical grounds; but the scheme has not been dropped, and in some shape or other will very speedily be brought into operation.

" Similar examinations for schools of a somewhat lower character have been organised under the name of prize schemes in the counties of Staffordshire, Cheshire, Shropshire, Warwickshire, and in South Wales. Others are proposed in Lancashire, Yorkshire, and Northumberland. In all cases when the examinations have been held, a very large number of candidates have presented themselves. At the Staffordshire examinations last year there were 644 candidates examined.

" It is true that in all these schemes, including that of the Society of Arts, prizes have been offered for competition. But in the first place, the number of prizes has not borne any proportion to the number of candidates; and in the second place, the majority of the prizes have been generally offered, after the scheme has been set on foot, by persons external to it; and I have no doubt that similar prizes to be awarded by the university examiners would be offered by persons desirous to encourage education in their own locality, in the scheme that I propose should be adopted.

" I think it impossible to see this general and spontaneous movement, differing in detail, but everywhere similar in real character, without perceiving that the universities have here a great opportunity. The organisation of all this spontaneous action is what they, and they alone, can accomplish. And to do this would be to confer on the country a lasting benefit, only limited by the good sense and tact of those who might be appointed to administer the plan.

" But I have yet one further, and perhaps more forcible proof, that I am not asking Oxford to take a premature, and therefore, a false step. After my conference with you the other day, I communicated the outline of my proposal to persons interested in education in various parts of the country. The result will be, I have reason to believe, the presentation of petitions to the Hebdomadal Council from several large towns, and some schools and educational associations, praying for the adoption of a plan of the sort. In bringing some of these petitions before the council, I shall hope for your co-operation.—Yours, &c., " F. TEMPLE."

The following letter in reference to this subject, is extracted from the *Daily News :—*

TO THE EDITOR OF THE DAILY NEWS.

SIR,—Permit me to make a few short observations on the subject matter of Mr. Temple's letters to the Master of Pembroke College, Oxford, published in yesterday's impression of the *Daily News.*

While I entirely concur with Mr. Temple in his views as to the value of authoritative examination, considered either as a powerful stimulus to promote, or as an accurate test to ascertain the quality of education, I am compelled to differ from him as to the feasibility of the means by which he proposes to extend the benefits of a system of this kind to the country at large.

Mr. Temple's proposition is to this effect, that the universities, Oxford especially, should hold periodical examinations at Oxford and Cambridge; that they should send down examiners to localities prepared to receive them; that there should be preliminary examinations; that the examinations should be conducted simultaneously by printed papers; that certificates of different grades and prizes should be awarded. In short, his proposal comes to this, that the Universities should appropriate the scheme of examinations elaborated by the Society of Arts after several years of careful consideration, and apply it to ascertaining the progress made by school-boys, while being taught at commercial and other similar schools. Now, in the first place, I may be permitted to doubt whether the University of Oxford would be cheerfully accepted by the middle classes of this country as the guide and controller of the education of their children; and, in the next place, even if the scheme were practicable, I question its utility. I do not consider it a wise proceeding, or conducive to the acquisition of sound learning, that boys should be always getting ready for an examination. The operation of acquiring sound and clearly-thought-out knowledge is a very different one from that of setting the knowledge so acquired in order, and getting it in hand for ready use at an examination. The two operations are to some extent incompatible. A gardener who should be always pulling up his carrots or his parsnips to see how they were growing, would have but a very poor crop when the time came to gather them up. I should be sorry to see a most valuable principle, when considered either as a stimulus or a test, used to accomplish ends for which it is wholly unfitted. The Council of the Society of Arts, in my opinion, follow a much wiser course, to test final results, not to meddle with intermediate processes. While a boy continues at school they leave his examinations to the school authorities; when he is leaving school and entering on the practical duties of life, the Society of Arts' Board of Examiners is prepared to certify to what purpose he passed his time at school. The rule laid down is to the following effect:—That no pupil of any Middle Class School in union with the Society of Arts shall be eligible for examination until his school education shall have been completed. Besides the College of Preceptors, a chartered body, is now, and for some years past has been, successfully engaged in conducting examinations of the class to which Mr. Temple refers.

Again, Mr. Temple objects that the Society of Arts has covered but a small portion of the ground which remains to be occupied. Now, nothing would have been easier for the Council of the Society of Arts than to have put forward a vast symmetrical plan of examination for the whole country, duly cut up into educational districts, and to have elaborated the details of this grand system —all on paper. But what would have been the result? Why, that the whole machinery would have fallen to pieces when it came to be set actually in motion. The Council of the Society of Arts followed a very different course. Four years ago they appointed a committee to inquire into this whole question of education. Having issued queries, and received from 700 to 800 replies, some of them important and valuable documents, this committee presented its report on industrial instruction (April 26, 1853). The importance of establishing a general system of examination is more than once pressed on the notice of the Council. The following extract may suffice:

"We have received," say the Committee, "a very large amount of decisive testimony in favour of some system of examination for provincial schools in connection with a central body which should be empowered to grant certificates of proficiency. On this subject the evidence is unanimous and decisive. Several of our correspondents, whose opinions are entitled to the gravest consideration, attach the utmost importance to a practical testing of results by means of examination. Some would go so far as to say that without some conservative provision of this kind no organisation, however perfect it may be at first, can long be secured from inefficiency and decay. Amongst others, we would direct attention to the important testimony of Baron Liebig, given at page 46 of this report."

Not satisfied with this, the Council of the Society of Arts proceeded to ascertain the sentiments of the great manufacturers, public companies, and other employers of labour, whether intellectual or physical, throughout the country. To a declaration of confidence in the Society's projected movement they obtained upwards of 500 signatures. Fortified with this document, and with the unanimous approval of the Mechanics' Institutions throughout the country, they held their first examination last year in the Adelphi. There were 52 candidates. This year it is proposed to hold them in London and at Huddersfield. Already there are nearly 300 candidates. Next year it is proposed to have some ten or twelve centres of examination. Thus the Council of the Society of Arts have proceeded tentatively and cautiously, step by step, led by the hand as it were by public opinion, corrected in their views by experience as they proceeded, and upheld by the approbation of the public in the course they have entered on. Without any solicitation whatever on their part, the prize list now exceeds £500.

Again, it is objected to the Society of Arts' scheme that a considerable latitude of choice is allowed; that a "man may be examined separately in history, or in English literature, or in geography, or in chemistry, and so on." Now, this freedom of choice, which is charged as a defect, appears to me one of the great advantages of the Society's scheme of examinations. It leaves men to follow the bent of their several inclinations, and to study those subjects for which they have a natural aptitude. It refuses to recognise the practice of laying down one or two mental grooves in which every man's mind should be compelled to run.

I may also be permitted to doubt whether the Uuniversity of Oxford, selecting from its own members only, could appoint a Board of Examiners which would in an equal degree command the confidence of the public with that which has given its services to the Society of Arts. It must not be forgotten that the Board of Examiners is the body directly responsible for the purity, soundness, and efficiency of the examinations. The Society of Arts and its Council act only ministerially in the matter. Now the Board of the Society is constituted of forty-five persons. Ten are members of the University of Oxford, nine of Cambridge, two of Dublin, six of Edinburgh, nineteen are fellows of the Royal Society, and thirty-two are either Professors in the Universities and great Public Colleges, or are practically and officially connected with education. I believe—indeed it cannot be doubted, that such a body of men, all of them eminent with but very few exceptions, constitute a Board whose deliberations will be of more value—the questions which arise being viewed from different aspects—than those of any Council or Committee selected exclusively from any one University.

It is worthy of grave consideration whether the independent and possibly the conflicting action of numerous local Boards constituted for the purpose of conducting examinations, might not tend to cast discredit on the entire scheme. Were Provincial Boards to "tout" for candidates, with promises, not expressed but understood, of easy examinations, numerous prizes, and a large issue of certificates, that contempt which now in most cases deservedly attaches to the "testimonials" of private persons would deepen into reprobation when the practice became an organised sham and a legalised hypocrisy.

I am, &c., JAMES BOOTH,
Chairman of the Board of Examiners of the Society of Arts.

The Vicarage, Wandsworth, May 2.

Home Correspondence.

THE THAMES EMBANKMENT.

SIR,—Agreeing with Mr. Bennoch as to the general desirability of the improvements he advocates, there are yet some essential particulars which he forgets, chiefly the question of air space. He gives us an arbitrary width of sixty feet for the gauge of streets, but omits the height of the buildings. In the present day the tendency is constantly to increase them in height, without regard to the width of the streets, and the result is that in the narrow streets of the City human beings are doomed to dwell the whole day through by the light of unhealthy gas. This is an evil which ought to be prohibited by the legislature as much as foul drains. Mr. Bennoch advocates the opening and widening of streets for the purposes of traffic, but he proposes also to diminish the air spaces—what are technically called "the lungs of London." Our parks are lungs which of late we have sought to enlarge, and our squares are lungs on a small scale. But the river is the largest lung of all, by reason of its width, mud banks and shores inclusive, which have kept the buildings from encroaching on it.

Mr. Bennoch proposes to narrow the river and keep its channel always under water without bare banks, by elevated embankments or quay walls. Along the edges next the river he proposes to form a railway, a roadway, and a footway. The Temple gardens are to be left as they are, in all the greenery that the London atmosphere will permit. In front of Somerset House a new garden is to be created for the benefit of the scholars at King's College; and from Scotland-yard to Westminster-bridge the abutting gardens are to be widened. But from Waterloo-bridge to Northumberland-wharf, blocks of lofty houses are to arise, narrowing the air-space of the river by one-third, and depriving London of that much of its largest lung, and of what might be converted into one of its most beautiful promenades at a small expense.

If the Londoners permit this, they will be the greatest dolts that ever permitted themselves to be gulled out of their choicest possession under a pretext. Why, of all things in the way of improvement, what we most want is to drive broad ways through the dense blocks of buildings, clearing them bodily out. Even that small patch near St. Paul's, enclosed in an unsightly wooden fence, is the subject of struggle to keep it unbuilt on. Every week we have some newspaper article dilating on the iniquity of building on Hampstead-heath, and here, at a bowshot from the Strand, lining the course of the river, we have the site of a boulevard finer than Paris can boast of, a power of prolonging Temple-gardens to Westminster at a small expense, and we listen in patience to a proposal to cover a great part of it with buildings already too dense. Rivers between quay walls are not beautiful; witness the Liffey at Dublin; and we do not want our Thames to be likened to a Dutch or Venetian canal. We do not want a lofty embankment; the Temple-gardens show us what we do want, and it will be utter madness to convert into private building property a site which nature has preserved for us for public uses through all past time. If our time were to come over again, if the banks of the river had been unbuilt on, we should take care to preserve roads and gardens along its borders through the whole length; and it is more worth an agitation than is the preservation of Hampstead-heath, to preserve what remains. We can get by rail to many localities; but no facility of rail along the river can compensate for the loss of air-space and the beautiful walk it is in our power to create. There is as much pretext for building on the site of Tower-hill or Trafalgar-square as on the river banks. The press some time back raised an outcry at the talk of the Temple benches "doing as they liked with their own," erecting a building on the site of the Fountain-court. It would be a far larger grievance for a company of individuals to possess themselves of the river banks to erect buildings there. We want our river, with its broad expanse, improved by art as much as may be; but not converted into a canal between lofty piles of buildings. The covering up of mud banks on rivers and sea shores with buildings has been pregnant with evil in many parts of the world. Planting them with trees—not jungle—absorbs the mephitic gases and renders them wholesome. I trust that until it shall have been demonstrated to be a desirable thing to cover all our squares and other open spaces with buildings, the press of London will raise its voice unanimously against any such barbarian invasion of the river or our future Thames-park, on either bank.

Mr. Bennoch objects to Mr. Rammell's plan of a "lamp-post railway." The disadvantages of laying rails on single columns are obvious; but duplicate the columns, and stretch the beams from side to side of the street, and much of the difficulty will vanish. We might thus obtain a practical roadway in the first place without impeding ventilation, duplicating our streets without much interfering with existing buildings. We might very conveniently remove our shops from the ground to the first floor. There is no reason why London-bridge should not have an iron scaffold railway, connecting the Blackwall line with the South-eastern, without interfering with the lower traffic, and without interfering with the beauty of the bridge.

I am, &c.,
W. BRIDGES ADAMS.

METROPOLITAN IMPROVEMENTS AND THE COAL TAX.

Sir,—In the discussion last week on Mr. Bennoch's paper, Mr. Haywood, advocating the continuance or extension of the coal tax, stated that this tax affects two classes; the poor and the rich, without pressing hard upon either of them, and that double the present amount might be raised with facility. He appears to have forgotten a third, and not unimportant class, the London manufacturers, including gas companies, water companies, engineers, &c. I believe our London consumption of coals is small compared with that of the large gas companies, but we find that even the present rate of tax, 1s. 1d. per ton, on a *weekly* consumption of more than 400 tons, amounting to more than £1,100 a year, to be a very serious charge.

Should, therefore, a London improvement fund be raised by a coal tax, we submit that a drawback should be allowed on coal used for purposes of manufacture.

We are &c.,
PRICE'S PATENT CANDLE COMPANY (Limited),
Per GEORGE F. WILSON, Managing Director.
1st May.

DISINFECTANTS.

Sir,—The perusal of Dr. Smith's highly interesting and instructive paper on "disinfectants," read at the Society's ordinary meeting, on Wednesday, the 22nd April, afforded me much pleasure. The subject, to me, is one of considerable magnitude and importance, residing, as I do, in a locality which has so long been suffering from an awful epidemic.

The learned Doctor, in speaking of the valuable disinfecting compound, commonly known as "M'Dougall's Disinfecting Powder," makes special allusion to this unhappy town, and the dreadful disease which broke out amongst us last year, immediately after disturbing our sur-charged graveyard. "The whole town," he says, "was disinfected with this compound, which, it is stated, proved 'most efficient in staying the plague—the disease assumed a milder form, and eventually disappeared.'" I regret, however, to state, that this awful disease has not "disappeared," but is raging amongst us.

That a temporary relief may be obtained by a copious use of M'Dougall's disinfecting powder, is an unquestionable fact; but, without wishing to detract from its value, I fear there is a danger of applying it (as in Leek) as a substitute for the observance of nature's laws. We may use Dr. Smith's compound with advantage in dealing with the effects, but nothing but the preventive measures alluded to by Dr. Playfair, in the discussion, will ever enable us to remove the cause.

In the interesting discussion that followed the reading of Dr. Smith's paper, Mr. P. H. Holland (Medical Inspector, Burial Department of the Home Office), makes rather a startling reference to this notorious town. "With reference," says he, "to the case of the epidemic in the town of Leek, alluded to by Dr. Smith, he (Mr. Holland) was, in the first instance, somewhat uneasy, lest the outbreak of the disease in that locality should have been, in some degree, occasioned by his own neglect. He had been told that it arose in consequence of the disturbance of the churchyard there, which he ought officially to have got prevented. But he was happy to find that he had been misinformed, for the medical men of the place assured him that the epidemic and the state of the churchyard had no connexion with each other."

Supposing the noxious gases sent floating over the town from the half-decomposed corpses, and the surcharged ground disturbed, to have been injurious to health, or, to any extent, the cause of the dreadful malady by which we are now suffering, I am at a loss to conceive how it can have been occasioned by Mr. Holland's neglect. This much I know, that as soon as the revolting account of the horrible proceedings in the churchyard was forwarded to the Home Office, the work was stopped. And if Mr. Holland is correctly informed that the disturbing of the churchyard and the epidemic had no connexion with each other, why was the churchyard pronounced so dangerous before it was disturbed? Why is the town put to the expense of providing a cemetery? Why are not the calculations and errors of the highest chemical and medical authorities in Europe exposed? Why are our local professors allowed to administer the very remedies such authorities prescribe, when the blood is said to be poisoned by such gases? If from 60 to 70 men rooting up a surcharged grave-yard in a town be a harmless thing, that has "no connexion" with disease, why are the local guardians of our health blamed for allowing the same kind of harmless gases to escape from the cesspools outside the town? Why trouble ourselves about disinfectants? If Mr. P. H. Holland be correctly informed, why does the State allow the General Board of Health to propagate its nonsense to the contrary? and why is the Registrar-General annually allowed to taunt us with his jargon to the same effect? I am, &c.,

AN INHABITANT.

Leek, April 27, 1857.

P.S.—Justice compels me to add that our medical men have been most unceasing in their efforts to save, and it is hoped that our authorities will yet see fit to carry out the wise measures which they have vainly recommended.

Proceedings of Institutions.

Greenwich.—Mr. C. W. Connon delivered a lecture to the members of the Literary Institution, on Tuesday, the 31st of March, on "American Slavery." A numerous audience gave evidence of the interest felt in the subject, and the respect entertained for the lecturer.

Waterford.—The annual report of the Mechanics' Scientific Institute was presented to the general meeting of the members held on the 26th day of February last. The Committee report that their efforts during the past year to promote the interests of the Institution have been attended with great success. They have devoted much attention to the Library. Nearly 1,500 volumes have been purchased, and 219 volumes and Parliamentary Reports have been presented. The average circulation has been 287 vols. per week, or 15,468 vols. per year; exceeding the circulation of the previous year by 5,744 vols. At the Reading and News rooms the attendance is progressively increasing. The following Courses of Lectures have been delivered:—By D. C. Bell, Esq., "Remarks on the Art of Delivering Readings from Shakspere and the Christmas Carol" (four). By A. G. Melville, Esq., M.D., on "Natural History" (nine). By George Baker, Esq., on "Moore's Melodies," "Shakspere's Songs," "Longfellow's Poems," and "Lays of Holyrood" (three). M. Gompertz also exhibited a Panorama of the late War. The attendance on each of these series of lectures exceeded anything ever before witnessed since the formation of the Institution; and the Committee urge upon their successors in office the desirableness of not confining their lectures exclusively to elementary science, but of engaging competent Professors on Literary subjects during the autumn and winter seasons. The English and Mathematical Classes, under Mr. Flynn, number nearly forty pupils, and the attendance thereat is both steady and respectable. The Committee regret that the attendance on the French Class has been greatly diminished, and it has, for the present, been discontinued. The Committee earnestly urge on their successors the necessity of making an effort to revive it, and suggest that the proprietors of all the large mercantile establishments of the city be waited on by a deputation from the Society, and solicited to use their influence with their young men who have not, as yet, availed themselves of the advantages offered. The income of the Institution for the past year has more than doubled that of the former one. The following gentlemen have been elected Vice-Presidents for the ensuing year:—The Dean of Waterford; Rev. John Crotty; Robert Keating, Esq., M.P.; John Mackesy, Esq., M.D.; Wm. M. Ardagh, Esq., J.P.; and Jas. Cavet, Esq., M.D. On the 1st inst., Mrs. Clara Balfour delivered a lecture on "Contrasts and Parallels in the Lives of Celebrated Women living at times of Great Revolutions in England, America, and France." Mrs. Balfour commenced with some introductory remarks, in which she called the attention of the audience to the side lights thrown by biography on the lives of historic characters, and that these side lights revealed the domestic position of the actor, and often influenced his career; as an illustration of this she painted in a rapid and instructive manner the family of Oliver Cromwell, dwelling particularly on his mother; she pointed out the loss of comfort and happiness that attended his elevation and success, and the unhappiness that resulted to his family from the constant dread of his being assassinated. Among the "Contrasts" she selected the lives of two eminent female writers of biography, one belonging to the Roundheads, and the other to the Cavaliers, who were similar in their misfortunes, though differing in their sentiments, and sketched the lives of Mrs. Hutchinson and Lady Fanshawe. Another of the contrasts in English life which she brought forward was that of Elizabeth Bunyan, and Lady Rachel Russell, each of whom during the trials of their husbands aided in their defence. Passing across the Atlantic she pictured the mother of George Washington, and described the effects of his early education, and then tracing the reaction of American on European politics, she passed under review four French ladies, Madame Roland, Charlotte Corday, Marie Antoinette, and Madame de Stael. The lecture was well attended.

MEETINGS FOR THE ENSUING WEEK.

Mon. London Inst., 7. Mr. T. A. Malone, "On Photography; its present condition and most important applications."
Geographical, 8½. I. Lieut.-Colonel Waugh and Mr. B. H. Hodgson, "Trigonometrical Survey of India and Mount Everest." II. Col. Sir Henry C. Rawlinson, "On Mohamrah and the Chaab Arabs, with reference to the late operations at the mouth of the Euphrates."
Tues. Royal Inst., 3. Dr. J. P. Lacaita, LL.D., "On Italian Literature—The *Cinquecento*—Lorenzo de Medici—Poliziano—Ariosto."
Civil Engineers, 8. Mr. G. B. Bruce, C.E., "Description of the method of Building Bridges upon Brick Cylinders in India."
Med. and Chirurg., 8½.
Zoological, 9.
Wed. Literary Fund, 3.
London Inst., 3. Prof. Robert Bentley, "On Systematic Botany, with especial reference to the natural systems of arrangement."
Society of Arts, 8. Mr. J. B. Smith, M.P., "On the means of obtaining increased supplies of Cotton."
Graphic, 8.
Microscopical, 8.
Archæological Association, 8½.
Ethnological, 8½. Mr. T. Wright, "On the Ethnology of the English Language."

THURS. Royal Inst., 3. Prof. J. Tyndall, "On Sound, and some associated phenomena."
Philosophical Club, 5½.
Royal Society Club, 6.
London Inst., 7. Mr. T. W. Burr, "On the History and Instruments of the Royal Observatory at Greenwich; and of other celebrated Observatories and Instruments, with the principal discoveries made by their means."
Antiquaries, 8.
Royal, 8½.
FRI. Royal Inst., 8½. Prof. Huxley, "On the present state of our knowledge of the Structure and Functions of Nerve."
SAT. Royal Inst., 3. Prof. E. Frankland, "On the Relation of Chemistry to Graphic and Plastic Art."
Royal Botanic, 3¾.
Medical, 8.

PATENT LAW AMENDMENT ACT.

APPLICATIONS FOR PATENTS AND PROTECTION ALLOWED.

[*From Gazette, April 24th*, 1857.]

Dated 26th March, 1857.

852. James Morris, Albert-square, Clapham-road—Certain Improvements in connecting the rails of railways.

854. François Rualem, 29, Rue de Paris, Belleville—Improvements in railway brakes. (A communication.)

Dated 27th March, 1857.

856. Alexander Delon, 39, Rue de l'Echiquier, Paris—An improved mould for the manufacture of buttons.

857. Edouard Hochstetter, Paris—The employment for motive purposes of sulphuret of carbon, an agent not hitherto so used. (A communication.)

858. Edmund Alexander Spurr, Newton-road, Bayswater—Improvements in fire-places, chimnies, and stove grates.

862. John Ward, Glasgow—Improvements in the manufacture or production of manures or fertilizing agents.

Dated 28th March, 1857.

864. David Thomson, Pimlico—Improvements in rotary pumps.

866. Ferdinand Jossa, St. Helen's Colliery, near Bishops Auckland, Durham—Improvements in furnaces and ovens for the prevention of smoke and for economy of fuel.

868. Robert Russell, Manchester—Improvements in railway turntables.

870. Louis Etienne Deplanque, 39, Rue de l'Echiquier, Paris—An improved composition for sharpening and setting fine-edged cutting instruments.

872. Joseph Thursfield, Congleton, Cheshire—An improved waterram for raising water.

Dated 30th March, 1857.

876. Joseph Scott, Glasgow—Improvements in bottles and their stoppering or closing details.

878. James Janson Cudworth, Ashford, Kent—Improvements in locomotive boiler furnaces.

880. Richard Handley Thomas, Kidsgrove, Stafford—Improved machinery for converting plastic substances into spherical forms or balls.

Dated 7th April, 1857.

969. William Neville, Jersey—Improvements in amalgamating certain substances for the production of fuel.

971. John Rothwell, Enfield, Middlesex, and Samuel Dixon Cooper, Westminster—Improvements in breech-loading fire-arms.

973. John Talbot Pitman, 67, Gracechurch-street—Improvements in apparatus called fire escapes. (A communication.)

975. Henry Dearden, Rochdale—Certain improvements in power looms for weaving.

977. Edward Finch, Bridge Works, Chepstow—An improvement in railway breaks.

979. William Sullivan Gale, New York—Improved means for rendering the joint of engines or other machinery steam or fluid tight.

981. Frederick Piercy and Samuel Flagg, 8, Belgrave-street, Argyle-square—A portable expanding life and military boat, which is also adapted for other purposes.

Dated 8th April, 1857.

985. Benjamin Hingley and Samuel Hingley, Cradley, Worcester—Improvements in anchors.

987. James Bird Sparke and Alfred Sparke, Thorne-lane Foundry, Norwich—Improvements in sawing machinery.

989. Edmund Edwards and Edward Beacher, Thorncliffe and Chapeltown Iron Works, near Sheffield—Improvements in machinery or apparatus for washing or cleansing mineral and other substances.

991. Alfred Vincent Newton, 66, Chancery-lane—Improved machinery for cultivating land. (A communication.)

995. Donald Bethune, Cambridge-terrace, Hyde-park—Improvements in apparatus for preventing or consuming smoke in chimnies and furnaces.

Dated 9th April, 1857.

997. John Harland, 31, Shield-street, Newcastle-upon-Tyne—Purifying plastic clay used for the making of all kinds of earthenware, and for the cheaper and more expeditious manufacture of bricks, tiles, draining pipes, and other articles of clay of a similar nature or description.

999. John Atherton Molineaux, Brighton—Improvements in economising heat in locomotive and other high-pressure steam-engines.

1001. Augustus Frederick Kynaston, 6, Osborne-place, Plymouth—Securing and disconnecting ships' boats and towing cables.

1003. Edwin Powley Alexander, 47, Lincoln's-inn-fields—Improvements in the manufacture of fulminating powder. (A communication.)

1005. Joseph Purnell, John-street West, Barnsbury—Improvements in apparatus for taking photographic pictures.

1007. William Clark, 53, Chancery-lane—An improved instrument for indicating the pressure of steam. (A communication.)

1009. William Armitage and Henry Lea, Farnley, near Leeds—Certain improvements in the manufacture of iron.

1011. John Beech, Shrewsbury, and John Williams, Wellington—An improved mode of securing the rails of railways in their chairs.

1013. John Coope Haddan, Cannon-row, Westminster—An improvement or improvements in the smelting and refining of iron. (A communication.)

Dated 11th April, 1857.

1015. Charles J. Bunker, New York—An improved life preserver, or life preserving shirt or sack.

1017. James Marrow, Sheerness—Improvements in machinery or apparatus for manufacturing bolts, rivets, nuts, and other similar forgings.

1019. John Matthews, Hurcott-mill, near Kidderminster—A new or improved vat, to be used in the manufacture of paper.

1021. Sebastien Didier Lheritier, Paris—Certain improvements in signals.

1023. Joseph England, Beverley, Yorkshire—Improvements in machinery for washing and wringing woven fabrics and similar articles.

1025. François Desir Lejard, Paris—An improved safety apparatus to be applied to the triggers of fire-arms.

1027. Thomas Wilton and John Huggett, Eastbourne—An apparatus for regulating the flow or supply of gas.

1029. Charles Sidney Johns, Barnard's-inn, Holborn—Improvements in preparing pulp for the manufacture of paper.

1031. Josiah Gimson, Leicester—Improved apparatus for preventing the explosion of steam boilers.

Dated 13th April, 1857.

1033. Jean Baptiste Pascal, Lyons, France—Improvements in electric lamps.

1035. Joseph Maurice, 316, Regent-street—Certain improvements in the fastenings, fixings, and attachments used for supporting or securing artificial teeth in the mouth.

1037. Joseph and Edmund Ratcliff, 59 and 60, St. Paul's-square, Birmingham—An improved mode or modes of adjusting chandeliers.

1039. William Edward Newton, 66, Chancery-lane—Improvements in the construction of boats, buoys, floats, or other buoyant vessels. (A communication.)

1041. Daniel Reading, Claverdon, Warwick—An apparatus for ventilating and increasing the draft in fire-places and flues.

1043. Pierre Victor Beaumesnil and Charles Erhard, 67, Rue Lafayette—A new and improved system of wheels for railway and other carriages.

1045. Charles Barlow, 89, Chancery-lane—Consuming the smoke and gases of furnaces, and at the same time furnishing a hot-air blast, being a smoke and gas consuming hot-air blast furnace. (A communication.)

1047. John Ramsbottom, Longsight, near Manchester—Improvements in wrought-iron railway chairs, and in machinery for manufacturing the same and other articles.

Dated 14th April, 1857.

1049. Peter Wicks, 10, Devonshire-street, Bloomsbury, and Thomas Goulston Ghislin, 7, Alfred-place, Blackfriars-road.—Superseding the use of bristles, cocoa fibres, flax, hemp, whalebone, &c., to be styled and called an invention for adapting and applying the fibrous plants of South Africa for the purposes of manufacture.

1051. John Rubery, Birmingham—Improvements in the manufacture of umbrella and parasol ribs.

1053. Richard Archibald Brooman, 166, Fleet-street—Improvements in machinery for mixing, solidifying, pressing, and moulding. (A communication.)

1055. Robert Knowles, Manchester—Certain improvements in machinery or apparatus for winding yarn.

1057. John Henry Johnson, 47, Lincoln's-inn-fields, and 166, Buchanan-street, Glasgow—Improvements in machinery or apparatus for raising and forcing of fluids. (A communication).

1059. Alfred Vincent Newton, 66, Chancery-lane—Improvements in carding engines.

1061. Henry Willis, Manchester-street, Gray's-inn-road—Improved machinery for supplying air to organs and free reed instruments.

Dated 15th April, 1857.

1063. John Coutts, Wellington lodge, Northumberland—An improved method of uniting together the parts of all kinds of floating bodies composed of metallic substances, as well as vessels for containing fluids, gases, &c.

1065. Alfred Vincent Newton, 66, Chancery-lane—Improved apparatus for taking the measurements for coats and other garments. (A communication.)

1067. Bonnet Frederick Brunel, Hampstead-road—Improvements in raising sunken vessels and other submerged structures and articles, and in machinery and apparatus employed therein.

1069. Thomas Richardson, Newcastle-on-Tyne, and Manning Prentice, Stowmarket—Improvements in the manufacture of manure.

1071. Jean Baptiste Leuillet, Paris—Improvements in binding account and other books.

Dated 16th April, 1857.

1073. George Raggett, 21, Duke-street, St. James's—Improvements in railway breaks and carriages. (A communication.)
1075. Samuel Thomas Crook, Halifax—Improvements in the mode or method of manufacturing iron retorts, safes, cisterns, ovens, boilers, chests, and other similar articles of iron manufacture.
1077. Robert Hindle, Sabden, Lancashire—Improvements in that apparatus used in calico and other printing known as the sieve.
1079. Isaac Sherwood and Joseph Blount Wayne, Birmingham—Improvements in certain apparatus to be attached to vehicles for the purpose of acting as a check upon the drivers or conductors of such vehicles, by indicating the number of passengers carried and the distance each has travelled.
1081. Johnson Hands, Epsom—Improvements in kilns, and in furnace and flues for withdrawing air and vapours from drying and other chambers.
1083. Samuel Newington, Ridgeway, Ticehurst, Sussex—Improvements in structures for growing grapes and other fruit.
1085. William Smith, 10, Salisbury-street, Adelphi—A smoke consuming furnace. (A communication.)
1087. George Schaub, Birmingham—A new or improved manufacture of types for printing.

[*From Gazette, May* 1.]

Dated 6th March, 1857.

656. John King, St. Swithin's-lane—Improvements in the manufacture of boots and shoes. (A communication.)

Dated 9th March, 1857.

680. James Andrew Cumine, Belfast, and Colin Hunter, Islandreagh, Antrim—Improvements in electro-magnetic engines and batteries.

Dated 31st March, 1857.

882. Jean Eugène D'Arcet, Paris—Improvements in distilling and rectifying tar, resin, oils, turpentine, bitumen, and other matters, and in the apparatus for the same.
884. Henry Francis, 456, West Strand—Improvements in machinery for ploughing and working land.
886. George Hamilton, Blackland Mill, Paisley—Improvements in the treatment or finishing of woven fabrics.
888. Frank Clarke Hills, Deptford—Improvements in manufacturing gas, and in apparatus connected therewith.
890. Josiah Wright, Hemel Hempstead, Herts—An improved method of bleaching straw plait and straw. (A communication.)
892. William Glover, Manchester—Improvements in looms for weaving.

Dated 1st April, 1857.

894. Robert Alfred Wright, Batignolles, near Paris, and Louis Jules Fouché, Paris—A new apparatus destined to produce chemical decompositions by means of superheated steam and water.
896. William Samuel Burton, Oxford-street—A new or improved manufacture of rollers or cylinders for printing fabrics.
900. John Leslie, Glasgow—Improvements in the treatment of wash waters containing soap, oils, saponified or saponifiable matters, for the obtainment of products therefrom.—(A communication.)
902. William Smith, Glasgow, Lanark—Improvements in the manufacture or production of ornamental fabrics.
904. Robert Wardell, Stanwick, Yorkshire—Certain improvements in reaping-machines.
906. Henry Smith, Stamford, Lincolnshire—Improvements in chaff-cutting machines.
908. John Crossley, St. Helen's, Lancashire—Improvements in machinery for smoothing glass.
910. Robert Martin, 14, Cambridge-road, King's-cross, and Joseph Walter Sutton, 32, Lamb's Conduit-street—Improvements in the means of giving alarm in dwelling-houses and other buildings in cases of robbery, fire, or other emergencies.

Dated 17th April, 1857.

1089. Samuel Messenger, Broad-street, Birmingham, and Theodore Fletcher, Birmingham—Certain improvements in gas-burners.
1091. Gabriel Arthur, Linares, Spain—Improvements in the manufacture or production of bricks, tiles, and other articles of earthenware.

Dated 18th April, 1857.

1093. Hippolyte Duhamel, jun., Clichy-la-Garenne, near Paris—Improvements in the fabrication of glass.
1095. John Wylie, Edinburgh—Improvements in pianofortes.
1097. George Davies, 1 Searle-street, Lincoln's-inn—Improvements in the method of laying underground telegraphic wires.—A communication.
1099. Henry Daniel Dearne, 18, Pigott-street, East India-road, Limehouse—Improvements in the floats or paddle-boards of paddle-wheels.
1101. Henry Heald, Sabden, Whalley, Lancashire—An improved method of packing pickers employed in looms.

Dated 20th April, 1857.

1105. Thomas Sanderson, Lothian-road, Edinburgh—Improvements in wheeled carriages.
1107. John Cowdery Martin, Fern-cottage, Charlewood-road, Putney—An improvement in the manufacture of paper.
1109. William Thomson, Dalkeith-gardens, Midlothian—Improvements in stoves or heating apparatus.
1111. John Stephen Jarvis, Wood-street—An improvement in the manufacture of stocks or ties for the neck.
1113. William Clay, Liverpool—Improvements in the manufacture of iron and steel.
1115. Thomas Wright Gardener Treeby, 1, Westbourne-terrace-villas, Upper Westbourne-terrace—Improvements on syphons and parts connected therewith.

Dated 21st April, 1857.

1117. Benoit Amédée Fournier, 51, High Holborn—Preventing on railways those accidents that occur through one locomotive running into another.
1119. Amory Fairbanks Sherman, Roxbury, Norfolk, Massachusetts—Improvements in machinery for the manufacture of ropes, strands for ropes, and for other purposes.
1121. Alfred Vincent Newton, 66, Chancery-lane—Improvements in rules and other measuring instruments. (A communication.)
1123. John Chanter and David Annan, Bow, Middlesex—Improvements in furnaces when moveable fire bars are used.
1125. Daniel Colladon, 62, Rue de la Victoire, Paris—Improvements in means and machinery for boring and cutting stone, earth, and other like substances, and for ventilating the places where such machinery is employed.

WEEKLY LIST OF PATENTS SEALED.

May 1st, 1857.

2588. Joseph Jessop.
411. David Barker.
529. William Edward Newton.
559. Auguste Godet.
571. Walter Macfarlane.
591. James Edward McConnell.
647. Thomas Burstall.
663. Rowland Mason Ordish.
665. Josiah Parkes.

May 5th.

2592. André Jacques Isaac de Montenay du Minhy.
2593. William Weild.
2610. George Henry Stephens and Robert Fitch.
2611. Joseph la Cabra.
2618. Frederic Chapman and Charles Bowyer.
2624. Amos Holt and Jabez Bentley.
2626. James Dickinson.
2630. William Gossage.
2631. Charles Vaughan, William James Vaughan, and Richard Vaughan.
2637. Rd. Archibald Brooman.
2644. Peter Gaskell.
2658. John Patterson.
2684. Thomas Beatt Sharp and Joseph Anthony Collet.
2686. Richard Emery.
2696. Archibald Reid and Charles O'Neil.
2709. John Drew.
2738. Alfred Watson and Alfred Hamlyn Williams.
2808. Peter Armand le Comte de Fontainemoreau.
2894. William Hadfield Bowers.
2898. John Longbottom.
2914. John Browning.
2994. Vincent Louis Cazimir Renou.
278. Isaac Holden.
280. Isaac Holden.
474. Robert Best.
487. James Crook.
548. William Wood.
582. Alfred Vincent Newton.
590. George Wilson.
604. Edwin Francis Jones.
624. William Edward Newton.
696. Nathan Appleton Dyar.

Patents on which the Stamp Duty of £50 has been Paid.

April 27th.

982. Alfred Trueman.

April 28th.

974. Walter Macfarlane.
975. James Fenton.
1085. William Edward Newton.
1104. James Horsfall.

April 30th.

971. Edward Briggs and William Souter.

May 1st.

1006. Edwin Haseler.

May 2nd.

996. Moses Poole.

WEEKLY LIST OF DESIGNS FOR ARTICLES OF UTILITY REGISTERED.

No. in the Register.	Date of Registration.	Title.	Proprietors' Name.	Address.
3972	April 22.	Combined Ruler, Scale, and Pencil Holder	Andrew Smith	Mauchline, Ayrshire.
3973	,, 27.	An Alarm Apparatus	George Rainsford	Berkley-street, Birmingham.
3974	,, 29.	Needle Wrapper	Joseph Morris and Sons	Astwood Bank, near Redditch.
3975	May 6.	Portable Poultry Pen	Joseph Cooke	Colchester, Essex.

Journal of the Society of Arts.

FRIDAY, MAY 15, 1857.

NOTICE TO MEMBERS AND INSTITUTIONS.

The prizes awarded by the Society's Examiners to the successful Candidates at the June Examination in London will be distributed on the morning of Tuesday, the 23rd of June, at the Society's House in the Adelphi.

The Society's Annual Dinner will take place at the Crystal Palace in the afternoon of the same day. Lord Stanley, M.P., will preside.

The Sixth Annual Conference of the Representatives from Institutions in Union with the Society, is appointed to be held at the Society's House on Wednesday the 24th of June.

The Annual General Meeting for receiving the report of the Council and the Treasurer's statement of receipts, payments, and expenditure during the past year, and also for the Election of Officers, will, in accordance with the Bye-Laws, take place at 4 o'clock on the same day.

SOCIETY OF ARTS DISTRIBUTION OF PRIZES AT HUDDERSFIELD.

A Deputation, consisting of Mr. Edward Akroyd, M.P. for Huddersfield; Mr. Edward Baines, of Leeds; the Rev. Dr. Booth, F.R.S., Treasurer of the Society of Arts; Mr. Crossley, M.P. for Halifax; Lord Goderich, M.P. for the West Riding of Yorkshire; Mr. Henry Pease, M.P. for South Durham, and Mr. Wickham, M.P. for Bradford, waited upon Lord Granville, at the Privy Council Office, to request his Lordship to preside at the Distribution of the Society of Arts' Prizes and Certificates which will be awarded after the ensuing Examinations in Whitsun week, and to take the Chair at the Soirée of the Yorkshire Mechanics' Union, when his Lordship was pleased to accept the invitation.

INDIA AND THE COLONIES.

The following letter, addressed to the Council, has been referred to a Committee to consider and report thereon :—

Gentlemen,—I wish to call the attention of the Council to a measure which will, in my opinion, greatly tend to promote the influence of the Society and to extend its revenue.

The Society of Arts has always taken a deep interest in our Colonial possessions, and is the only public body at this time to which the Colonial interests can refer; but, nevertheless, they require, as we all know, still further attention and development, and a still closer alliance. I propose that a special section be formed for India, another for Australia, one for English America, and so on; that the Indian section shall hold an evening meeting each fortnight, and that a paper shall be read on some Indian question; and for the Australian section a monthly meeting.

The Indian or Australian section, for instance, would have not only a special opportunity for discussing topics affecting the arts, manufactures, and commerce of the section, but of appealing to an organization of those by their pursuits interested in the realisation of these objects, and, by their position, enabled to bring an effective influence to bear for their promotion. It is in co-operation with these sections that the value of the Society's Parliamentary Committee will be most sensibly felt, and from which, again, it will receive accessions of strength.

If we consider the subject, now, I may say, before the Society—the extension of the cotton cultivation in India, we shall see how much more effectively it will be promoted by such permanent organisation of the Society, than by a single and casual appeal made to one of our general meetings, for it is to the Indian section the representatives of Indian companies, associations, and interests will resort, as the only centre available to them in the metropolis for promoting the arts, manufactures, and commerce of India. The cotton question is, however, but one amongst many of great importance, which have been already partially discussed by the Society, or which have not yet been considered. Such are railway extension, irrigation, canals, European colonisation, tea cultivation, fibre products, the coal fields, the iron manufacture, and the copper mines.

By this or a corresponding organisation, permanent benefit would be conferred on India, Australia, Canada, the West Indies, and on the colonies generally, while the Society of Arts, by exerting a practical and powerful influence in their behalf, would acquire a new title to public respect.

At the present moment there is no one connected with the colonies who does not sensibly feel, as a great want, the non-existence of a colonial centre and re-union, and when he considers the benefit conferred by the occasional opportunities afforded by the general meetings of the Society for advocating colonial interests, he cannot but earnestly desire that these operations of the Society should become of a more permanent and extensive character.

I am, &c.,
HYDE CLARKE.

TWENTY-FIRST ORDINARY MEETING.

Wednesday, May 13, 1857.

The Twenty-first Ordinary Meeting of the One Hundred and Third Session was held on Wednesday, the 13th inst., Thomas Bazley, Esq., in the chair.

The following Candidates were balloted for and duly elected members of the Society :—

Hide, Charles
Phillips, Edmund
Royston, John Power
Waldegrave, Hon. Granville
Walford, Cornelius, jun.

As a Corresponding Member.

Barnard, Hon. Henry.

The following Institutions have been taken into Union since the last announcement :—

438. Carshalton, Mutual Improvement Society.
439. King's Lynn, Athenæum.

The Chairman said, the subject to be brought before the meeting that evening was one of the most important that could occupy the deliberations of the citizens of London, involving, as it did, the supply of a material whereon so much of the capital and labour of the country was employed. In the north of England there were some millions of people dependent upon the trade and manufacture of cotton, and to them the object they had in view that evening was one of vital importance. But to the whole community the cotton industry of the country was now a question of great magnitude; for, if they reflected upon the position which it held in reference to our foreign trade, they would find that one-third of the exports of the United Kingdom were supplied by the cotton industry, and that, as the exports of the country purchased the imports, about one-third of the imports of the country was also dependent upon the same industry. At the present moment the position of the cotton trade was in peril from the lack of an abundant supply of the raw material, and unless that raw material were supplied in much larger quantities than they now possessed, he believed there would be great distress, especially in the north of England. Price at all times regulated the degree of consumption that any commodity attained, and at the present time they had prices so high that the consumption of cotton manufactures was greatly diminished, and unless they had increased supplies of the raw material at more moderate prices, the trade would gradually droop. It was remarkable that in the British dominions they possessed a greater extent of ground capable of producing cotton than was possessed by any other country on the face of the earth. At the present time, as they were aware, they received their largest supply of this material from the United States, and the taxes of the country were largely contributed to by the industrious classes engaged in the cotton manufactures; he believed the customs duties would be very much diminished if that manufacture were curtailed. It was a duty which they owed to themselves and the country, to obtain, if possible from the dominions of Great Britain, a larger supply of that raw material than they now obtained; and as in public as well as in private matters, the course of duty was generally the course of interest, he believed in promoting the production of cotton, especially in our East Indian territories, they would perform a duty to themselves, and at the same time promote their own interests. The islands of the West Indies were also capable of producing more cotton than they required, but there was a scarcity of labour in those islands, which must stand in the way of any larger production than at present. He now begged to call upon his friend Mr. Smith to read his paper.

The paper read was :—

HOW CAN INCREASED SUPPLIES OF COTTON BE OBTAINED.

By J. B. Smith, M.P.

The inventions of Arkwright and Crompton for spinning cotton in England, and that of Whitney in America for cleaning it, whilst they have largely contributed to the wealth of this country, have, by cheapening the production of cotton clothing, greatly promoted the comfort and civilization of millions in all parts of the world.

The importance of our cotton manufactures is best shown by the fact that, besides providing clothing for our whole population, our exports last year amounted to £38,284,700, being one-third of the value of our entire exports to foreign countries; any serious interruption, therefore, to a manufacture in which millions of consumers are interested, would be little less than a world's calamity.

It is much to be desired that our supplies of the raw material for so great a manufacture should be derived from a variety of sources, that we may, as far as possible, be thus protected from the fluctuations in prices incident to good or bad seasons; but unfortunately they are chiefly derived from one source. The imports of cotton into Great Britain last year amounted in round numbers to 900,000,000 lbs., of which 700,000,000 lbs. were received from the United States. But not only are we exposed to the danger of being limited chiefly to one source of supply, but to a still greater hazard, viz., that this supply is the production of slave labour. It may be that the institution of slavery, although condemned by all civilized nations, may yet exist for ages in the United States; or it may happen that occurrences may any day endanger its continuance. The alarm created by recent symptoms of discontent among the slaves in that country, is evidence that their owners themselves are not without apprehensions of danger, and it is impossible for those interested in the cotton manufactures of this country to contemplate with unconcern the insecurity on which their vast manufacture rests. This is not a local question; it has become a great national question, and must be forced upon the attention of statesmen of all parties. To me it appears the importance of the subject can scarcely be over-rated, and this is my apology for venturing to offer my humble contribution to its consideration.

In the earlier stages of the cotton maunfacture, we derived our supplies of the raw material from various quarters in the Mediterranean, the West India Islands, Brazil, and South America; and so late as 1810, our imports from the United States were only 246,759 bales, while from all other countries they were 314,414 bales. In that year Upland cotton ranged from 15d. to 22d. per lb., and West India cotton from 21d. to 2s. 4d. per lb. From this time the growth in the United States kept constantly increasing; and it is evident, from the stocks on hand in our ports for about ten consecutive years, being equal to from 33 to 53 weeks' consumption, that the production of cotton had overtaken the demand. The effect of this over-supply was a constant decline in prices, and a struggle between the producing countries, as to which could afford to grow it cheapest. The rich lands and superior cultivation of the United States enabled her successfully to outrival all competitors, and almost to monopolise the supply of the European markets.

The decline in the prices of cotton from 22d. per lb. to 5d. to 8d. per lb., gave a great stimulus to increased manufacture, and during the same time the constant improvement in machinery led to a cheapness of production which has resulted in an increase of consumption as wonderful as it has been beneficial. In the last 40 years, the consumption of cotton in Great Britain has increased from 88,000,000 lbs. to 891,000,000 lbs.

The increase in the growth of cotton has not for some years past kept pace with the increased consumption, and instead of large stocks on hand in our ports, at the close of the year, as in times past, our stock in the ports at the close of the last year was only equal to 12 weeks' consumption; and it is evident that we have arrived at the turning point of the consumption having overtaken the production. The question has, therefore, been forced upon our attention, How can our supplies of cotton be increased?

In considering this question, we are led to suppose that an advance in price of the raw material will encourage increased cultivation, and it will doubtless have this effect, but it must be borne in mind, that in those countries from whence we formerly received supplies, the growth of cotton has been abandoned for that of more profitable produce, and that before cultivators can be led to return to it they must be induced, first, by high prices, and secondly, by an assurance of a continuance of high prices. We cannot, therefore, hope, under the most favourable circumstances, to receive supplies from our ancient sources.

Attention has been directed, from time to time, to the capabilities of Western Africa for the growth of cotton, and it may probably, ere long, become an important source of supply. Seven years ago, a benevolent gentleman, Mr. Thomas Clegg, of Manchester, conceived the idea that there was a plan of abolishing slavery which had never been tried, and which promised greater success than any other, and at comparatively little sacrifice of time, labour, and expense. Mr. Clegg's plan was simply to convince the native African chiefs that they could gain more by employing their people on the spot than by selling them to the slave-dealers. By means of the missionaries, he furnished cotton seed to any one who chose to grow it; he sent out simple instructions how to grow, clean, and pack cotton, and also sent the means of purchasing any quantity, however small or large. The first season, only about 235 lbs. were obtainable; the second year, 14,000 lbs.; and the third year, about 30,000 lbs. Since that time, the growers, encouraged by the profits, and finding they can dispose of any quantity, have begun to cultivate it more extensively; and Mr. Clegg expects to receive this year 1,000 bales, equal to 1,200,000 lbs.; and next year, 10,000 bales. Mr. Clegg has had three African youths for two or three years at his own mill, preparing them for future usefulness in their own country, by teaching them every process of cleaning cotton without injury to the fibre. They were also taught the trade of carpentering, mechanics, &c.; and with an intelligent young African surgeon, educated in England, who has also taken up the subject, are all now in Africa engaged in cleaning, packing, and shipping cotton to send to England. This is one of the most interesting experiments ever undertaken, and may lead to consequences which are gratifying to contemplate.

Cotton has been grown in Natal, Australia, and on the borders of the Euphrates and the Tigris, and may be grown in most countries situated within certain latitudes; but to grow it in new and barbarous countries to any extent, will, besides the expenditure of considerable capital, probably require ages. What we want are immediate supplies. How are we to get them? We naturally turn our attention to a country, where it is estimated that at the present moment more cotton is grown than in the United States; a country under the dominion of the British crown; overflowing with an industrious population; a boundless extent of land, where the cultivation of cotton has not to be learnt, but where it has existed from the earliest ages.

India is capable of furnishing us with an unlimited supply of cotton. Why we receive so little, is the subject to which I am desirous of directing your attention.

Our supplies of cotton from India, in former times, were larger even than from the United States. In 1818, our imports from India amounted to 247,659 bales, while those from the United States that year were only 207,580 bales.

But the price of India cotton was then 17d. per lb. In 1822, the price had fallen to 6½d. per lb., and the imports fell to 19,263 bales. In 1841, the imports increased to 273,000 bales. In 1846, they fell off to 49,500 bales. Our imports from India have at all times been irregular; the quality of the cotton being inferior to that of other countries, it is only in times of scarcity and high prices that it has been forced into use. The price of Indian cotton, ruling in the market about 2d. per lb. below that of American, so long as the latter can be purchased at 5d. to 8d. per lb., India cotton is neglected, and falls to a price at which imports become unprofitable. The importation of cotton from India has been discouraging; stocks have been held on hand for years, and occasionally have been almost unsaleable, and imports must, at times, have been attended with great losses. The stocks of Indian cotton on hand in our ports at the close of each year, shew that, at the average rate of consumption, there were on hand during the years 1818 to 1824, from 120 to 240 weeks' consumption, and so recently as 1844 there were 107 weeks' consumption; in 1845, there were 130 weeks' consumption; in 1846, there were 75 weeks' consumption, while the stock on hand on the 31st December last only amounted to 23 weeks' consumption.

It is scarcely to be expected, with such facts before us of an irregular demand, and prices equally irregular, that India has looked to England as a customer for her cotton. No country will grow produce for an uncertain demand; and until India can rely upon a constant and steady foreign demand, she will only grow it with a view to her own consumption. It is probable that the advance in prices will bring us large imports from India during the current year, but they will not come from an increased growth, but will be drawn from the stock grown for home use. Our demand, therefore, being only occasional, is productive of similar effects to the demand for foreign corn during our corn laws; it was prejudicial, inasmuch as it raised the price of corn upon the inabitants of all those countries to which we resorted in our need, and who, being unprepared for the demand, had only grown enough for their own supply.

It is the interest of India either to have a constant demand for her cotton, or to be relieved from the losses incident to an occasional demand. But to secure a constant demand, it is necessary that she be able to compete with America, and this leads to the inquiry into the capabilities of India for producing cotton equally cheap and good with that country.

In 1848, this subject engaged the attention of parliament; Mr. Bright, the member for Manchester, moved for a Committee of the House of Commons to inquire into the growth of cotton in India. I had the honour of being appointed a member of that committee, which obtained a mass of valuable information as to the obstacles which prevent India from successfully competing with the United States.

India is connected in the popular mind with wealth and fertility; the riches of India is a popular illusion. The land of India is not generally fertile, and is not to be compared with that of the Western World; an acre of land in India produces 50 to 70 lbs. of clean cotton; in America the same quantity of land yields 400 lbs. of clean cotton. The lands of America are rich and fertile, and are watered with rains throughout the year. The land of India, on the contrary, except on the borders of the rivers, is parched by a burning sun, and is, during eight or nine months of the year, almost without rain; nevertheless it is a singular fact that there is a greater fall of rain in India than in America; and if it were collected by artificial means, instead of being allowed uselessly to run away to the sea, the land would be made capable of yielding two or three crops a-year, and would then be assimilated in fertility to that of America.

There is abundant evidence that India possesses capabilities of producing unlimited supplies of cotton, sugar, coffee, tobacco, corn, flax, hemp, and a variety of other articles; it is desirable that we should possess clear views of the obstacles which exist to India becoming what, in the popular mind she is supposed to be, a country abounding in wealth and fertility, in order that our exertions may be directed to the practical means of removing those obstacles.

The cause of the extreme sterility of the soil of India is the want of sufficient moisture. Irrigation, then, is indispensable to increased production. "The savages of Australia," Col. Cotton well observes, "trod upon gold for hundreds of years, while they were often in want of food, and always without a rag of clothing; and very similar has been the state of things in India. With an unlimited supply of water within reach, which, if applied to purposes of irrigation, would more than provide for every possible want, the people of India have been generally barely supplied with the necessaries of life, and often so entirely without them as to perish by hundreds of thousands; and their European rulers, with this treasure within their reach, of far greater value in proportion to the cost of obtaining it, than the richest gold-mines in the world, have been unable to make their income equal their expenditure."

That the native governments and the people appreciated this invaluable method of increasing the fertility of the soil, is shown by the ruins in all parts of the country of great works of irrigation. We have instructive proofs of the consequences of the destruction of works of this kind in the present condition of Egypt, Ancient Babylon and Nineveh, once the abodes of wealth and civilisation, but where, since the absence of irrigation, the soil which maintained their vast populations is become a sandy desert; and from the same causes millions of acres, in a similar condition, are lying waste in India.

The fall of rain in India is more than sufficient to irrigate all the cultivable land. By a free supply of water alone, without any additional skill, the produce of the land might be increased three or four-fold, and the quality greatly improved. The complaint of Dr. Royle, the East India Company's botanist, is, that the climate is too dry, and the methods of raising water in India are *all* too expensive for the cotton crop. "This country," says Mr. Mercer, the planter brought from America by the East India Company, "is too dry, and we shall find it so in comparison with the valley of the Mississippi. All India is dry; not that there is not more rain falls during the year in some parts of India than falls in the same time in Mississippi, yet what does fall there is scattered throughout the year." Mr. George Vary, who had 12 years' experience in India, and was late superintendent of the government cotton experiments in Sattara and Sholopoor, says, "The cotton plant, as at present cultivated, is an annual. The seed is sown towards the end of the monsoon. The bush seldom exceeds 3½ feet high, and 40lbs. per acre of clean cotton is considered a fair crop. After the cotton is collected the bushes are pulled up and burned, as they all die during the hot weather for want of moisture. By irrigating cotton you will be able to retain the same bushes for several years. I have seen a bush nine years old, producing three crops yearly of fine cotton; you will, therefore, get two or three crops yearly instead of one. Instead of 40lbs. per acre you will probably get 200 to 300lbs. yearly per acre, and the quality of irrigated cotton is 150 per cent. better than field cultivated cotton, which is easily accounted for.

In the non-irrigation system, the hot weather suddenly sets in, the bush, from the want of moisture, becomes dried up and stunted, and this renders the cotton short and crisp. The samples of cotton I have seen grown in gardens, or where there was plenty of moisture, are as fine, long, and silky as any in the world, and there is no doubt, if it could be produced in large quantities, it would be preferred to American or any other." Dr. Buist bears similar testimony to the effects of irrigation, which he has seen, in increasing the quantity, and in improving the fineness and length of staple of the cotton. We have, besides, the authority of Sir John Lawrence, that the produce of cotton from irrigated land near Delhi was 384 lbs. of clean cotton per acre.

This evidence is decisive that, by means of irrigation, India can produce cotton of equal quality and in equal quantity with America.

There are all over India remains of works of irrigation in a state of ruin or decay. The existing mode of watering the land is rude and costly, consisting, 1st. of the Persian wheel, by which water is lifted in earthen jars of about two quarts each; sometimes worked as a treadmill, by manual labour, but more commonly by bullocks. 2nd, Lifting water from pools or tanks with a leathern bag. 3rd, Lifting it with a wooden shoot. 4th, Lifting it from wells, 30 to 60 feet deep, with a bucket. The cost of irrigating one crop, by the least expensive of these modes, would amount to 12s. to 36s. per acre. Almost all the existing canals for irrigation are constructed in an extremely defective manner, and only supply water to the land sometimes during four months, and sometimes only during two months of the year. That which is required is, that we should avail ourselves of the superior engineering skill of the present age to devise a great systematic plan of irrigation, by which the whole country should be furnished with canals of irrigation, supplied by the rivers at all times with water, and which might also be used as canals for the cheap conveyance of produce. India affords great facilities for works of this nature, and it is estimated that land might be furnished with a constant supply of water for irrigation, by these means, at a cost of 2s. 6d. per acre per annum, besides providing water conveyance.

The awful depopulation of the country by famine, in 1837-1838, in consequence of droughts, roused the government to emulate the Mogul Emperors in works of irrigation, and to make the Ganges canal, which, including branches, is 800 miles in extent. But the whole of these kind of works executed by the government in 100 years, at an expense of about £2,500,000, are only calculated to irrigate about four millions of acres, in a country comprising an area of about 800 millions of acres of land.

Roads and communications are a fundamental element of national prosperity and wealth. But it may be said of India that she has no roads, there being only 3,000 to 4,000 miles of metalled roads for a population of 150,000,000, while in England there are 120,000 miles of metalled roads. What would England be without roads, canals, railroads, ports, and public works? For want of roads in India cotton is brought a distance of 400 miles to a shipping port on the backs of bullocks, each bullock carrying about 240lbs. The journey occupies two to three months, and it frequently happens that the cotton is overtaken by the rainy season, the streams and torrents become impassable, and droves of bullocks die on the road from over-fatigue. When the railway reaches the cotton district, which, at the past rate of progress, may be expected some 10 to 15 years hence, the transit to a shipping port, which on an average has hitherto occupied 64 days, will be accomplished in 36 hours. Mr. Mackay says, "It is a misnomer to call the rude tracks in Guzerat roads; in the civilized and ordinary sense of the term there are none in the province." He relates that it took him seven hours to traverse in a bullock cart the road between Jamboosar and the port of Tankaria, a distance of 12 miles, and long before his arrival at the end of his journey there was scarcely a bone of his body which was not the seat of pain. "On the way," he says, "the mamlutdar amused us with several stories of accidents which had occurred on the road, one of which related to the sad fate of a trader, who received such a jolt as made him inadvertently bite the end of his own tongue off." Nor is this road a mere byeway, leading to a village or two, but a great thoroughfare, forming the main outlet to a large and rich tract of country.

So long ago as 1839 railways were projected in India, but they have hitherto made the same slow progress with everything useful in that country, only about 200 miles being yet opened, while during the same period in the United States, upwards of 20,000 miles have been completed. It remains to be seen whether railways, constructed more for political and military purposes than for commerce, will fulfil their professed objects of facilitating the carriage of produce to shipping ports. Railroads are better than no roads, but bulky produce will not bear expensive carriage from long distances. If it were not for the cheap water communications of America, probably not a hundredth part of the produce now brought to a port down the Mississippi, and other parts, from great distances, would find a market. The cost of conveyance in America by the lakes is from $\frac{1}{9}$th to $\frac{2}{9}$ths of a 1d. per ton per mile; by the Erie canal it is $\frac{2}{9}$d. In India, down the Ganges, it is ¼d. to ¾d.; and by the Madras canals, ⅛d.; while the freight of cotton from Berar to Bombay on pack bullocks is 10¾d. per ton per mile.

One of the greatest obstacles to the increased production of cotton in India is the tenure of land. A wise tenure of land lies at the foundation of the future welfare and improvement of the people of India.

It has been said that, in eastern countries, from time immemorial, the sovereigns have been the sole owners of the soil, and have generally levied for the requirements of the state a certain portion of the produce, varying from one-tenth to one-fourth. In our Indian possessions, the Government claim the same sovereign rights—and, except in Bengal, no person in India, native or European, can own in fee-simple a single acre of land.

Mr. Mangles, the present Chairman of the East India Company, in his evidence before the India Cotton Committee, thus defends this right:—"The rent of land (he says) has never been private property in India. The Government of India, like any other government, may be an unfaithful trustee, but I hold that the land revenue of India, if there were a republic constituted in India to-morrow, belongs to the community as their right, for the purposes of good government, including irrigation, and roads, and canals. If there was the freest government in the world, it would be for public purposes, and if you gave that, or any part of it, gratuitously to the person who happened to be a cultivator of the soil, or to have certain rights in connexion with the soil, you would rob the other classes of the community. If the government, as trustees, take this money, and waste it in foreign wars, or waste it in any other way, they are, *pro-tanto*, unfaithful trustees. It is a great public fund, like the tithes in this country, appropriated to the national church; any diversion of that would be a robbery of the parties to whom it belongs. It is in that point of view, and because I wish to see other impolitic taxes abolished, that I desire to see the land revenue maintained in its full integrity, and, if it can be justly done, increased."

Instead of levying their rent in produce, the East India Company levy it in money. In some of the cotton districts the practice is for the government to make an annual assessment of each field cultivated by the ryots, at such times as the state of the crops enables the collector to estimate the amount which the cultivator may be able to pay. It must be evident that a system like this is destructive of all stimulus to exertion or improvement. It converts the ryots into mere human bees, permitted to exist for the sake of creating wealth, but like those industrious insects, denied the reward of its enjoyment—every year collecting a fresh store, but every year stripped of all, except enough to maintain existence until the season returns for repeating the robbery. That such a tenure results in creating a most abject class of cultivators is not surprising, when it is stated by Mr. Davis, one of the East India Company's collectors, that the whole sum left by the government, for the subsistence of the human bees in his district, amounted to 3s. for cultivating an acre of cotton!

The rack-renting of the Bombay ryots, and the necessity of reducing their assessments, was proved before the Committee of the House of Commons, in 1832, but it was not until it had caused the utter ruin of the people in some parts of the country, and the consequent decline of the revenue, that the government were induced to listen to a considerable reduction of the assessments, and to giving leases to the cultivators. The system of granting leases at low average rates for 30 years, has been carried out in the southern part of the Bombay presidency—the government reserving the right to re-assess every field at the expiration of this term, to increase the rent, in proportion to the increased value derived from the application of the labour and capital of the cultivator, and to turn out the existing occupier, if he refuse to pay the increased rent demanded by the tax collector. But even this partial improvement does not appear to be yet begun in the cotton districts of Candeish and Guzerat, or in Madras.

The exactions of the government from an impoverished people produce the usual results of oppression, demoralisation, chicanery, deceit, and cunning, and render it difficult to collect the government rents without resort to some kind of force. Official inquiries have proved the practice of torture for the purpose of exacting exorbitant rents, and that even women are tortured in a manner which cannot be mentioned. Those acquainted with the country state that the practice obtains, more or less, throughout India, and will continue, so long as the system of oppressive exactions and a corrupt and demoralised police are permitted by the government.

It is no less remarkable than instructive, however, that in the district of Rajahmundry, where the lands have been rendered more productive by irrigation, and the condition of the people improved, it is no longer necessary to use threats or force to collect the rents. They are now cheerfully paid; and Mr. Taylor, the revenue officer of that district, officially reports that 24 villages in one talook, stimulated by the improvement in their outward circumstances, had voluntarily proposed that a permanent addition should be made to their land-tax, to be applied to the establishment of schools for the education of their children.

Nothing can be more mistaken or impolitic than the system of land tenure in India. No country can ever rise beyond barbarism, so long as the state has the power to take, at any one moment, any given amount of the produce of the soil; where there is no stimulus, poverty must always prevail. It is not a sufficient justification for continuing this system, that it is said to have always existed in the East. The presumed object of all governments being the happiness of the people, a comparison of the condition of the people in those countries where the sovereigns are the owners of the land, and of those where it is owned by the people, would seem to be the best test of the superiority of either. Experience shows that in every country, in the same proportion as the monopoly of the land exists, is the poverty and wretchedness of the people; and we accordingly find that Egypt and all other countries of the East contain the most miserable populations in the world. In the United States, and in the British colonies, as in India, the whole land belonged originally to the government, but instead of adopting the Indian custom of letting it out to tenants and employing thousands of officers to assess every field and collect the revenue, both countries have adopted the wiser policy of selling the land to the people in fee-simple for ever, and giving those who cut down woods and cultivate lands such advantages as to induce them to convert the wilderness into a smiling country. Had their respective governments adopted the Indian system of land tenure, and said to the people "go and cultivate the backwoods, bring the land into productive fertility, and give the surplus profit to the state," how many emigrants would have gone forth to till the ground on such conditions? Who would ever have heard of such flourishing countries as the United States, Canada, and Australia? The contrast which the condition of the people of these countries presents to that of India, is decisive of the superiority of their land tenure in promoting the welfare and happiness of the people. Some of the ablest Indian statesmen have advocated the policy of placing the land tenure on the same footing as our colonies. Lord Wellesley said, 50 years ago, "It can never be desirable that the government should act as the proprietor of the land, and should collect the rents from the immediate cultivators of the soil. And even the East India Company, in a despatch from the Court, so long ago as 1809, expressed its disapproval of the annual and individual settlement with the cultivators. "The Court," says the despatch, "also dwell upon the obvious defect of the system—the minuteness of investigation which it involves, the necessary employment of countless native agents, the impossibility of effectually preventing their mal-practices, and the difficulty of adjusting the rents to all varieties of the season and public events;" and conclude, "that, although the plan, intelligently followed up, might be well calculated to discover the resources of a country, yet it was not to be preferred for constant practice."

In Ceylon, Penang, Singapore, and Hong-Kong the Indian policy of land tenure has been abandoned. The land in these colonies is either sold by auction in perpetuity, or for leases of 999 years, with trifling quit-rents. The result is an encouragement to European settlement and enterprise, and such an improvement in the condition of the people as to mark these countries as the most flourishing of our eastern possessions.

The state of the law and of the police is another crying evil in India. Hindoo, Mahomedan, and English law is administered by incompetent and under-paid functionaries, without professional training or the practice or study of the law. In the Supreme Courts at Calcutta, Madras, and Bombay, the law is administered by English judges, and although 95 per cent. of the suitors are natives, the system gives satisfaction. But in the Mofussil, or country, there is no code of procedure. The Judges of the Sudder Court are appointed by the East India Company from their own officers, and though they receive salaries of £3,000 to £5,000 a year, are not qualified by education or previous training to fill these important posts. Young men of 22 or 23 years of age, without knowledge of the world, or of law, are appointed as magistrates and judges. Boy magistrates and boy judges are the scandal of India, and no wonder that the system results in dissatisfaction and complainings. Neither person nor property is safe; bands of robbers infest the country, and the kind of protection afforded by the corrupt police is best shown by an extract from the minute of Mr. Haliday, deputy-governor of Bengal. "The most urgent necessity (he says) exists for a thorough revision of the police throughout the country. The establishment of village watchmen is described as not only utterly useless for police purposes, but a curse instead of a blessing to the community. *It is even a question whether an order issued throughout the country to apprehend and confine them would not do more to put a stop to theft and robbery than any other measure that could be adopted.*"

The advantages to India of European enterprise and capital, are incalculable: but who can be induced to settle in a country in such a state of insecurity? The indigo planters have petitioned the Indian and English governments to protect their persons and property by just laws and an efficient police, and have an agent now in England to press their claims. Within the past 15 years, upwards of three millions of people have emigrated from England to different parts of the world, but, according to an official return in 1852, the number of British subjects in India, not in the service of the Company, residing in the interior of the country, and engaged in agricultural or manufacturing pursuits, including indigo and sugar planters, farmers, landed proprietors, cotton agents, &c., does not exceed in

Bengal	273 persons.
Madras	37 persons.
Bombay	7 persons.
Total	317

In the towns there are

Males	5,729
Females	4,277
Total	10,006

What a condemnation of the government of the East India Company; of its land tenure—its want of roads, want of law and justice—absence of every thing which tempts men to leave their homes for foreign lands!

A change in the system of government in India is no less indispensable to its future welfare. Hitherto, no honours nor rewards await any governors but those who extend our territory; dazzled by the glories of war and new conquests, no encouragement is awarded by the government to the real benefactors of India—those who conquer barbarism by seeking to develop the resources of the country and to improve the condition of the people. The attention of the government being distracted by continual wars or insurrections, they have no time to attend to the wants of the people, while the revenues, being squandered in conquests, nothing remains to be applied to roads and public works, which the government alone possess the means of making.

Every governor-general sent out to India excites expectations only to disappoint them. Much was expected from the administrative abilities of Lord Dalhousie; with great professions of regard for the welfare of the people, he quitted India, leaving the great social grievances of the people unredressed, and, with the exception of the electric telegraph—railways had been proposed for India before his arrival—during an administration of ten years, he has not originated a single measure for the benefit of India. Lord Dalhousie says, in his minutes, that "the essential interest of England requires that the territory of Nagpore should pass under the British government; for the possession of Nagpore will materially aid in supplying a want, upon the secure supply of which much of the manufacturing prosperity of England depends." That is the article of cotton, the importance of which, he says, was urged on him personally, by the Chamber of Commerce at Manchester. His lordship takes a very mistaken view of the means of promoting the growth of cotton; there are millions of acres of land in our own possessions suitable for the production of cotton, without further conquests or annexations. Had the sums expended in his wars been applied to roads, canals, irrigation, and other public works, Lord Dalhousie would have taken a more effectual means of promoting the growth of cotton, as well as of all other produce; he might have covered India with prosperity, and left a name behind to be remembered with gratitude to the latest posterity.

If, then, the obstacles which weigh upon the energies of the people, and prevent them from developing the resources of the country, were removed, India presents unbounded means of supplying us not only with cotton, but with supplies of raw produce of all kinds; but at present Java, with her ten millions of people, yields more than India with her 150,000,000. The improvement in the condition of the people which would follow upon wise and just government would enable them to consume our manufactures of all kinds to an immense extent. It is almost incredible that India, with her 150,000,000 of people, consumes a less amount of our manufactures than are consumed by a few thousand people in Australia! We have the evidence of Sir Thomas Munroe, late Governor of Madras, that the small demand for our manufactures arises solely from the inability of the people to consume them. "If," says that distinguished friend of India, "the existing mode of taxation should be abandoned, the country, instead of rice and dry grain, would be covered with plantations of betel, cocoa-nut, sugar, indigo, and cotton, and the people would take a great deal of British manufactures, for they are remarkably fond of them, particularly of scarlet. It is a mistaken notion that Indians are too simple in their manners to have any passion for foreign manufactures. In dress, and every kind of dissipation but drinking, they are at least our equals. They are hindered from taking our goods, not by want of inclination, but either by poverty or the fear of being reputed rich, and having their rents raised. When we relinquish the barbarous system of annual settlements, when we make over the land either on very long leases or in perpetuity to the present occupants, and when we have convinced them, by making no assessments above the fixed rent for a series of years, that they are actually proprietors of the soil, we shall see a demand for European articles, of which we have at present no conception." If India were able to consume our manufactures in the same proportion as the United States, our exports to India alone would exceed our present total exports to all parts of the world. What a field for British enterprise!

We have incurred a fearful responsibility, as a nation, by our conquest of India. We have forcibly taken under our rule 150,000,000 human beings unfit for free institutions; the British people are therefore bound before God to see that steps are taken to promote their happiness by wise and just laws, administered by a paternal government, with a view to prepare them for higher destinies. How have we hitherto fulfilled this responsibility? We profess to deplore the abomination of slavery—we have abolished it in our own dominions—we have entered into treaties with foreign states to abolish the slave-trade—we keep armed squadrons to put it down—we glory in these deeds, and, in a pharisaical spirit, pride ourselves that we are not as other nations. But we are all the while the governors of 150,000,000 of human beings in India, groaning under burthens and oppressions which render it doubtful whether their condition be not worse than the slavery we so much condemn in others.

It is proposed to form an association in the manufacturing districts of Lancashire, for promoting the growth of cotton in various parts of the world, with the view to obviate the exisiting dependence chiefly on one source of supply. There are doubtless great advantages in association and union to obtain definite objects. I have endeavoured to show that India is capable of furnishing an unlimited supply of cotton, and that the obstacles which prevent it are—

1. The want of works of irrigation.
2. The want of roads and cheap conveyance.
3. The want of a secure tenure of land, in perpetuity, similar to that enjoyed by all the British colonies and the United States.
4. The want of just and well administered laws and an efficient police.

These are objects which the people of England may legitimately demand of the government, and which the government, in justice to India, are bound to carry out.

Let it not be supposed that by asking of the government the expenditure of large sums for irrigation, roads, and canals, the manufacturers of Lancashire are seeking for any peculiar favours to be granted to them. Mr. Mangles, the Chairman of the East India Company, acknowledges this to be the duty of the government, and is one of the purposes for which they claim the monoply of all the land. So far from asking any favour from the government, they are simply asking them to fill their treasury. The profit accruing to the public exchequer, from the outlay of such public works as are most needed, is so extraordinary, that the only wonder is why so little has been expended.

The outlay of £180,000 in irrigation, in the province of Rajahmundry, yielded, in six years, an increased revenue of £60,000 per annum and an increased production of £220,000 a year; so that an outlay of £180,000 produced a return of £280,000 per annum. In Tanjore, an outlay of £250,000 in public works produced an increased revenue of £200,000 a year, and an increased value of land of £200,000 a year, so that, in this instance, an outlay of £250,000 produced a return of £400,000 a year! The tolls received on the Coomptah road paid off the outlay the first year. Colonel Cotton states that, "the average return on all the new irrigation in the Madras Presidency, for the last fourteen years, is seventy per cent., taking the whole of the years since their execution. The *present* annual profit is at least cent. per cent., and that without counting the improvement of private property.

The government of India have incurred a debt of upwards of £50,000,000 for war purposes. Why cannot they borrow for making public works? In India the department of public works should be considered one of the very first in the state. There would be less difficulty in raising funds on the credit of the government for objects of acknowledged public utility than for purposes of war; and the profits attending public works are so enormous, that if they were faithfully set apart, as a sinking fund in extinguishing the debt, India might be covered with public works for nothing.

It is contended by the Indian authorities, rather as it would seem, as an apology for their inertness and neglect, that even if the roads were good and the lands of India were irrigated and made productive, it does not follow that we should obtain more cotton from India than at present. That India produces a variety of produce, and she will naturally grow that which yields most profit. That supplies of cotton are a question of price, and unless we can afford to give such a price for it as will yield at least an equal profit with other produce, that cotton will not be grown.

No doubt these are specious arguments, but it may be answered that India has at all times produced a variety of products, but has never ceased to grow cotton; and it may therefore be inferred that cotton has been as profitable as anything else. That if by irrigation the quantity of produce be increased, the various products will still bear the same relative value to each other as at present. Cotton would be grown then as it is now, but if irrigation increased the quantity grown 4 or 5 fold, the cost of production would be diminished; and with improved and cheaper modes of cleaning, good roads, cheap and expeditious modes of transit to market, cotton could be afforded at a less cost, and with better profit to the grower than before irrigation.

Mr. Nesbit Shaw, formerly a collector of revenue in the Dharwar district, is decidedly of opinion that India can, even at present, compete with America, not, however, by growing indigenous cotton, but by fairly turning attention to the steady introduction of superior varieties, by introducing all practicable improvements, and by a rigid determination to put down adulteration and other frauds in the trade. Mr. Shaw tried the experiment, under many difficulties, of growing on unirrigated land several thousand bales of cotton from New Orleans seed. This cotton was sold in Manchester at 6¼d. per lb., while the native cotton only sold at 3½d. per lb. The produce from New Orleans seed is about 100lbs. of clean cotton per acre; from native seed it is only 60 to 70lbs. per acre. This cotton from New Orleans seed only yielded about 1½d. per lb. to the cultivator, and if this left as large a profit as other kinds of produce, it would continue to be grown for a constant demand. Colonel Cotton estimates that at least one anna (1½d.) per lb. could be taken off the cost of bringing cotton to market by improved communications. In this case India cotton from New Orleans seed might be laid down in Liverpool at 3½d. or 4d. per lb. But supposing, by means of irrigation, the land were made to yield four or five fold, unless the government raised the assessments of the ryots in proportion, and appropriated all the improvements to themselves, the cost of production would be so reduced as to enable India to compete with the lowest known prices of American cotton.

In a country, however, where the cultivators of cotton are so poor and wretched, and where the unfortunate ryot usually mortgages his future crop before it is grown, at a rate of interest amounting from 40 to 50 per cent. per annum, it cannot be expected that he will be induced to depart from the old system of cultivation, or try experiments with new seeds, or new or more economical methods of cleaning cotton. It seems, in the peculiar condition of India, that European influence, agency, and capital are indispensable to an early and large production of cotton of improved quality. This is a subject which would properly engage the attention of an association formed for promoting the growth of cotton, as also the means of delivering the ryots from the exactions of the money-lenders and middle men, of whom a resident of many years thus writes:—"The middle men are proverbially the greatest villains in the country. There is a series of two or three of them through whom the cotton passes before it gets into the hands of the Bombay merchants. To the first man of the series the material passes, probably in as good and clean a state as would altogether satisfy the most fastidious of our manufacturers. But with this commences the process of deterioration. He sells by *weight* rather than quality. He exposes his purchases to the hot wind, and thus gains a few ounces of dust, and to the dew at night, and thus gains a few pounds of moisture. He then disposes of it to another party, who gives it a second edition of dust and dew, and further adds the sweepings of the cleaning gins, and seed of cotton, and other minute particles of refuse. I have known these broadcast on layers of cotton, which are then rolled up into the loose bales, or bundles, in which state the brokers of the Bombay merchants purchase the material."

An excellent opportunity is presented of encouraging the growth of cotton without one farthing of expense or of risk to the government. The province of Candeish is one of the richest in India, and peculiarly suited for the growth of cotton. The country is covered with ruined towns and villages, which attest its former prosperity. At present only 14 per cent. of the whole province is cultivated, the remaining 86 per cent. lying waste; of which Captain Wingate, the Revenue Survey Commissioner, says, "Nearly the whole of this is comparatively fertile, and suitable to the growth of exportable products, such as cotton, oil seeds, &c." "The ryots," "he says, are ready and anxious to extend their cultivation, but dare not do so with their present rates. A reduction would, I am satisfied, cause an immediate and great extension of cultivation where there is waste to break up." Captain Wingate was again and again asked by the ryots to assess all the land of their villages, whether good or bad, at one and the same rate, to escape the corrupt exactions of the assessors. They would then, they said, know exactly how they stood, and be able to take up waste without hesitation, which they never could do as matters are now managed.

Here is also an opportunity for the Indian government to try the experiment of a secure tenure of land in perpetuity, such as exists in all the British colonies, and in the United States—a system which has resulted in an amount of prosperity and happiness which might be equally enjoyed by India. The people want the land, and would gladly cultivate, on these terms, all that is now laying waste. Every farthing the government received from unoccupied land would be clear profit—industry would be promoted, capital accumulated, the attachment of the people would be secured, and the experiment would be tried, without cost, whether a greater revenue could not be raised from prosperous farmers than from poverty-stricken ryots. There are in Candeish five million acres of land capable of growing cotton, and also great facilities of irrigation.

There is land enough in this one province alone, capable of producing more cotton than is now grown in the United States.

It may be asked, however, is it possible to find a demand for such an enormously increased production of cotton? I well remember the incredulity with which the prediction of an eminent, but sanguine, Liverpool cotton-broker was received, viz., that the time would come when our consumption of cotton would reach a million bales per annum! But at the weight of the packages of that day we are now consuming upwards of three million bales per annum. Perhaps I may be accused of the like apparent extravagance when I say, that I can see no reason why our consumption should not reach 6,000,000 bales a year.

There is no limit to the consumption of cotton but the want of a cheap supply of the raw material, and that I have endeavoured to show it is possible to obtain.

Look at the extraordinary increase in our foreign trade since we freely opened our ports to the produce of the whole earth. If any Leaguer had had the temerity to predict, that in 10 years from the establishment of Free Trade, our foreign trade would be doubled, he would have been pronounced as fit only for Bedlam. Yet so it is. Free Trade has doubled our exports in 10 years, but it has yet greater triumphs in prospect. Independently of India, which may be made capable of taking from us as much as our present exports to all the world, Free Trade has become as much a necessity with all nations as railways are to the prosperity of a district. We see towns without railways become isolated and decline, and so it will be with nations who cling to prohibitions and monopolies.

In conclusion. In dealing with the future of India, let us "be just, and fear not." It is fortunate that in seeking to develop her resources, our duty and our interests go hand-in-hand. If it be possible to render the lands of India equally productive with those cultivated by slave labour, who can foresee the consequences? It may aid the solution of interesting problems. Can slave labour, costing 2s. a day, successfully compete with Indian free labour at 3d. a day? And what will be the saleable value of human beings, should slavery cease to be profitable? Who can tell, but that justice to down-trodden India, may be the instrument, in the hands of Providence, of hastening the emancipation of the down-trodden race of Africa?

DISCUSSION.

Mr. J. B. **Sharp** said, that looking at the amount of capital invested in the several branches of the cotton manufacture, at the number of persons employed in it, and at the innumerable interests dependent upon it, the importance of the subject could not be overrated. The author of the paper had taken a retrospective view of the supplies of cotton from an early period of the present century, but it might not be without interest to go a little further back, and show the gradual progress of the trade in this commodity, especially with the United States, and, in like manner, to note the falling off in the supplies from some other countries upon which we were formerly more immediately dependent for cotton. The present annual production of cotton in the United States was, in round numbers, 1,300 million pounds weight. This would seem to be the work of generations; but it was not so. It was the result of efforts made within the period of a single life. He (Mr. Sharp) might truly make that remark, since the first importation of cotton from the United States into this country took place in the same year in which he was born. In 1784, the year succeeding the final establishment of their independence, eight bales of cotton were imported from the United States into Liverpool, and so little were the authorities then aware of the capability of that country for the production of cotton, that the Custom-house officers actually seized those bales for an alleged violation of the Navigation Laws as then in force. This was certainly commencing on a very minute scale, eight bales weighing something more than a single ton. But little progress seemed to have been made in the next ten years, for, in 1794, the total export was only 1,600,000 pounds, of which 348 bales were imported into Liverpool. A few years after, the cultivation rapidly increased, for in eleven years more, that is, in 1805, the exportation was 40 millions, and in a further period of ten years, 1815, it had reached 83 million pounds. Passing thus briefly over those early periods, he came to the year 1821, from which date he purposed taking rather a fuller view of the question, chiefly because he had in his possession the official accounts of the American government, showing the exports for each of the 35 years, from 1821 to 1855, in quantity and value. This term of 35 years he (Mr. Sharp) divided into seven periods of five years each. It would be desirable, in the first instance, to show the total exportation of cotton from the United States for each period of five years, distinguishing the portion which came to this country from that sent to all other parts of the world. The export from America was, in the several periods of five years each, as follows:—

PERIOD.	Total Export from the States.	Of which to this country.	To all other parts.
	Million lbs.	Million lbs.	Million lbs.
1821 to 1825	762	569	193
1826 to 1830	1,272	867	405
1831 to 1835	1,695	1,230	465
1836 to 1840	2,621	1,841	780
1841 to 1845	3,643	2,490	1,153
1846 to 1850	3,551	2,494	1,057
1851 to 1855	5,128	3,424	1,704
Totals......	18,672	12,915	5.757

The aggregate export from the United States in those 35 years, it would be seen, was to the enormous extent of 18,672 millions of pounds, of the computed value *there* of 1,829 million dollars, or £381 millions sterling, of which this country took 12,915 million pounds, or rather more than 69 per cent. of the whole, of the value of £263 millions sterling, being an average of 7½ millions sterling for the whole term, or, taking the last five years separately, the value of our proportion was 68 millions sterling, or an average of 13½ millions sterling per annum. All the rest of the world took 5,757 million pounds weight, about half of which was exported to France. It was not necessary, and might be difficult, to compute the exact weight of cotton consumed in the United States. The earliest information afforded on that head referred to the year 1827, when the consumption was stated at 103,480 bales; and, with occasional variations, it had gone on progressively, until, in 1856, it reached 652,739 bales; which, at the rate of 400 pounds per bale, gave 261 million pounds as the quantity converted into goods in that country in the last year. With reference to the price of cotton at various times within those 35 years, as valued officially on the other side, the highest and lowest prices during that time were 10½d. and 3d. per pound. The value of 10½d. existed only for a single year, 1825, the highest prices at any other period having ranged between 8d. and 8½d. for four years, viz., 1821, 1823, 1835, and 1836. The lowest price of the whole term was in 1845, when it stood at a minute fraction below 3d., and in 1843 and 1849, at small fractions above 3d. per pound. These were all the extreme rates deserving of notice. The general average price of the whole 35 years was $9\frac{8}{10}$ cents, or $4\frac{9}{10}$d., say 5d. sterling per pound, which average was also within a shade of that which existed during the last five years of the term. The present price in the American ports, according to the latest quotations, was 13½ to 14 cents, being 6¾d. to 7d. sterling, which, upon an annual consumption of 700 million pounds, would add between five and six millions sterling to the general average of the consumers' price on this side, carrying the whole value of the year's supply to about twenty millions sterling. He would glance, for a moment, at the cause of these various rates of value. The fluctuations, as regarded the quantity supplied, were very extensive, having been, on several occasions, as much as 200 or 300 million pounds of increase or decrease in two consecutive years; and, in one instance (1850), there was a fall of 400 million pounds below the quantity of the preceding year, and a rise of 300 millions in the next year. He (Mr. Sharp) inclined to the opinion, that these fluctuations were, in the main, brought about by the higher or lower prices realised in the preceding year. The United States, however, were not the only source of supply. There had been considerable importations from other quarters—the East Indies, West Indies, Brazil, and the Mediterranean. The entire import, in the 35 years, from all countries, other than the United States, was—

	Pounds.
From the East Indies	2,087,000,000
,, West Indies	95,000,000
,, Brazil	798,000,000
,, Mediterranean	397,000,000
All other parts.........................	85,000,000
Together	3,462,000,000

making, with that from America, the aggregate of 16,377 million pounds as the entire import. There were exported, in the same time, 1,713 million pounds, leaving, as the entire supply for home consumption, 14,664 million pounds, or an average, for the whole term of 35 years, of 419 million pounds per annum. It might be well to show, in a few words, the value of that proportion of the last-mentioned quantity of cotton, worked up at home, which was exported in goods and yarn. The total declared value of manufactured goods exported in the 35 years from 1821 to 1855, both inclusive, was 598 millions sterling, and of yarn, 194 millions sterling—together 792 millions sterling. If they added to this the large value of the manufactured goods consumed at home, which would fall little, if at all, short of the value exported, the great importance of the whole question, in the general affairs of the country, must be admitted. He would now direct attention to the second and more pressing consideration—the question of future supplies of cotton; how far we might place reasonable dependence upon the United States; and to what other countries we must look for the supply of a continually increasing demand. He had lately passed through Bolton; and the number of mills just completed, or in course of construction, struck him as very extraordinary. He could not but think that they were losing sight of the fact, that land could not be cultivated, seed sown, and the fruit obtained, with the same rapidity that mills could be built. If the other manufacturing districts were all to pursue the same course, an extra million of bales would hardly afford the means of keeping them at work. But the present question was, how the present supply was to be maintained on terms more moderate. In addition to the United States there were four well-known scources open—the East Indies, the West Indies, Brazil, and the Mediterranean; besides other quarters, brought more recently under notice, as Western Africa, Australia, and Natal in South Africa. The Brazils and Egypt, not being under British control, would naturally be wholly guided by a regard to their own pecuniary interests, in whatever measures they might take to increase the cultivation of cotton; and there they must be left. Western Africa, Australia, and Natal, might be looked forward to with some confidence by the next generation, but not to any extent by the existing race of cotton manufacturers. Much pains would have to be taken to organise a proper system of labour in Africa, whether in the western or the southern districts. The Negro and Kaffir were alike too migratory in their habits to settle down, within any short period, to regular works of industry; and in Australia, the rates of labour must materially change before it could be applied to the cultivation of cotton with any chance of renumeration to the growers. Samples had been produced from the western parts of Africa, as well as from Australia and Natal, of excellent staple and general good quality. This left no doubt of their power and their estimated produce. They were therefore thrown back upon the East Indies, which always had produced considerable quantities of cotton, chiefly, however, of certain rather low qualities; and upon the West Indies, which did formerly produce it, and could again, in any quantity, and of very superior quality, on certain well-understood conditions. In the East Indies labour and land were superabundant; although in many parts where the cultivation had been attempted, there were influences of climate, or other causes, in operation, which had impeded the success of the undertaking;

the produce in many instances, being also too small to supply even the moderate wants of the ryots. Mr. Smith had already drawn attention to the want of sufficient communication between the places of growth and those of shipment, and had pointed out the absolute necessity for improvement in the means of transit. It was to be hoped that the time was approaching when the power of supply of cotton from India, extending over vast tracts of country, from Madras and the Malabar coasts of the south, in a northerly and north-westerly direction, towards Surat and Bombay, including the districts of Berar, Broach, and other favourite localities for that particular culture, would be developed to an extent commensurate, not only with the present, but the anticipated consumption. He saw no reason to despair of seeing, in due time, the staple, general quality, and improved system of cleaning brought to such a condition as to approach, if not to equal, the quality of American Upland cotton. This, in fact, was nearly accomplished in the southern provinces of Hindostan and in the island of Ceylon. It must, however, be borne in mind that China had always been a large customer to India for cotton. Existing official accounts shewed, for a succession of years, an average annual export from Bombay to China of 450,000 peculs, equal to 60 million pounds weight, and it had been sometimes much more. He would now turn to the question of the capability of the West Indies for affording supplies of cotton. The same year that the United States sent us 8 bales, the West Indies supplied above 25,000 bales; and those supplies continued to average from 30,000 to 40,000 bales a year, until gradually swamped by the enormous increase in the United States, and finally almost annihilated by that continued increase and the effect of negro emancipation. Most of the West India islands contributed more or less of cotton in those days, particularly Jamaica, with its four millions of acres. If a line were drawn from east to west through, or a little below, the centre of the island, the greater portion south of that line, not employed for other purposes, would produce excellent cotton. There were also many parts north of that line which would also produce cotton, but the greater portion of the northern half of the island was too hilly to be favourable for that growth. The colony of British Guiana was formerly the favourite spot for cotton cultivation. The cotton of Demerara and Berbice was admitted to be second only to Sea Island in quality; and, within the last few days, a sample grown in Demerara had been exhibited, which was judged to be in no respect inferior to Sea Island. The Fibre Company with which Mr. Sharp was connected had lately been enabled, through the means of Mr. Clegg, of Manchester, to send to the colonies a parcel of choice seed of the Sea Island cotton, in order that experiments might be made. Mr. Sharp then called attention to the capabilities of the colony of British Guiana. There was not a spot in the world more capable of producing, in perfection, almost every product of the tropics, than that splendid colony. With an extent of surface of 75,000 square miles, or 48 million acres—a soil of almost unequalled depth and richness—vegetation of the most luxuriant character—and considerable facilities for communication by water, and to some extent by rail—there was no limit to its productive powers, and but one drawback—the scarcity of labour. Of its forty-eight million acres a space of twenty-eight miles square would yield 500,000 bales of cotton a-year. As to the special advantages of this colony for the growth of cotton, there was a coast line of about 250 miles, stretching from the River Corentin, the boundary of Surinam and Berbice on the east, to the River Orinoco on the west, possessing for cotton cultivation, all the advantages of the Sea Island district of the United States. Much of this was in the olden time laid down in cotton of superior quality; and could be so applied again with the greatest advantage, and without prejudice to the other products of the colony; since the coast portion of it, so favourable for cotton, was not so well adapted for the production of sugar. Labour, however, was wanting. For the consideration of this subject, there was held at George Town, the capital of Demerara, on the 26th of March, a numerous and most influential meeting of the colonists, when resolutions were unanimously passed, and a petition to parliament decided upon. All the colonists required was, the removal of those needless and vexatious regulations which had seriously impeded immigration, but which it was now to be hoped would be done away with for the advantage of all classes; and the men of Manchester must, if for their own sakes only, lend their strenuous aid to accomplish that end. He (Mr. Sharp) feared that the measures of government had been on this point too much influenced by the representations of those who propagated a belief that all measures for promoting the immigration of labour into the colonies had been so many steps in the direction of absolute or virtual slavery. He did not think that there were ten men in the British dominions who desired, or who would not most strenuously resist, any step that should promote a renewal of that system. Mr. Sharp concluded by expressing his satisfaction at the recent formation of an association in the manufacturing districts for promoting this object.

Mr. E. WATKIN, M.P., remarked that the author of the paper had rendered great public service, not only in exhibiting the dangers to which the country might be exposed from a short supply of cotton, but also the remedy to be applied in this important matter. This might be a somewhat dry question; but it was a deeply important one, affecting the welfare, the progress, and the happiness of so large a portion of our population. He felt it a disgrace that the English nation should have been so long quiescent, while the vast continent of India had not been developed for the production of this material as it ought to have been, and that the East India Company should have been allowed so long to have neglected this important subject. The author of the paper had drawn attention to the fact that they were at the present moment dependent upon slave labour for their supplies of cotton. But how long would that system last? He believed there could not be found a single man, north of Washington, who would venture to guarantee the existence of slavery for another 50 years. In 1856 they received 1,000,000,000 lbs. of cotton, 700,000,000 lbs. of which came from America. That was double the quantity of cotton they imported 10 years before; but, notwithstanding the consumption of cotton in this country had increased 100 per cent. in 10 years, yet it was the fact that the slaves in the United States had only increased at the rate of 28 per cent.; the same also was the rate of increase in 1810 as compared with 1800. When, therefore, they saw that the increase in the amount of labour was not sufficient to supply the increasing demands for cotton, they must naturally have recourse to their own possessions for the production of that commodity; and he trusted that those who were moving in this direction would receive the aid and co-operation of the country at large in so important an object.

Mr. HYDE CLARKE would briefly call the attention of the meeting to an important region in India, which united all the conditions necessary for the cultivation of cotton. On the map before them, of the Northern Bengal Railway, would be seen laid down the Sub-Himalayan region, peculiarly suitable for producing this material of a superior quality, because the rains came on after the sowing, so as to prevent the drying up of the plant. Dr. Campbell had carried out a series of experiments in the culture of cotton in these districts, and in a letter to the *Times* of the 16th Feb. last, had made the following statement:—

> You are aware that the Court of Directors and the Government of India, in their anxiety to introduce foreign cottons into India, went to the expense of having American cotton planters

to try different kinds of foreign cotton in Bundelcund to the westward, and in Rungpoor and Dacca—rich and very productive districts of Northern Bengal. In reading the result of these trials I was much struck with the stress laid by the planters on the want of rain at and soon after the sowing season, as being adverse to the full success of their experiments. This was particularly the case in Bundelcund; and also, but to a smaller extent, in Bengal. It was, therefore, a great object to find a climate with a wetter spring than the plains of Bengal, and this we have in the terai or lowlands at the base of the Eastern Himalaya, and in the outer valleys of the Darjeeling hills, where indigenous cotton is regularly cultivated. The cotton-sowing season is in February and March, and it is remarkable that about the middle of March frequent showers begin to fall, and continue to do so throughout April and May. This secures sufficient moisture to the young plant, and the scorching of it is obviated. It was with a view of turning this favourable feature of the Darjeeling climate to good account that 12 cwt. of acclimatized Sea Island cotton seed was procured by me from Coimbatoor, in the Madras territory, and tried in the Darjeeling terai. It grew excellently; just as well as the indigenous cotton, and the pods were well formed and abundant. The seeds were smaller than in the local plant, and the cotton was beautifully fine, but I was informed by the Agricultural Society of Calcutta, that the staple was shorter than that of the indigenous Sea Island cotton. Whether this was attributable to the specimens being the produce of seed grown in India I do not know, but it would be very important to make a trial with seed direct from the Sea Island district, as the Darjeeling district offers great inducements for the cultivation of foreign cottons on account of its soil, climate, and vicinity to Calcutta, as well as on account of the facilities which are now coming into play for rapid transit by means of the East India Railway, the proposed Northern Bengal Railway, and the other feeders to the East India Railway, which must soon develope themselves as necessary and profitable accompaniments of this great and successful undertaking.

Dr. Campbell had fully proved the capability of this region, to produce Sea-Island cotton, of good, though as yet, but of short staple. Although this district was, in itself, unhealthy, yet it possessed the advantage of close proximity to one of the healthiest parts of India, the range of the base of the Himalaya, where European invalids were frequently sent, and where by immigration a large population might be created. There was an opinion expressed in the paper, from which he begged to dissent, namely, that railways would do little or nothing for the cultivation of cotton in India. He was fully convinced that, looking at all the elements of the question as laid down in his (Mr. Clarke's) work on this subject,* there could be no doubt that the nominal price of transport, by railway, road, or water conveyance, gave but a limited means of comparison, if the other elements of speed, safety, &c., were omitted from the consideration, and that railways could be used as cheaply and advantageously in India as in the United States. With regard to the land tenure question, he fully agreed with the author of the paper as to its importance. He believed that by the introduction of a wiser system, the returns might be so largely increased as ultimately to afford means for paying off the national debt. He hoped the association lately formed in Manchester would receive the cordial support of the Society of Arts; for the meeting should bear in mind that this was the only society in the metropolis where colonial questions could be advantageously discussed, and he was anxious that its organisation should be so extended as to afford increased facilities for developing the resources and promoting the welfare of our colonial possessions.

Sir ERSKINE PERRY, M.P., said, If the cotton manufacturers of this country had come forward three years ago, when the enquiry with regard to British India was before Parliament; or if they had come forward 20 years before that, when the inquiry took place with reference to the China trade; or 20 years before that, when the trade with India was the subject of investigation by the legislature, he had no doubt that enormous advantages would have resulted in reference to the great question of the supply of cotton to this country. From what he had heard respecting the association which had been formed at Manchester, he hailed it as a movement pregnant with immense prospects for the future. The manufacturers had at length turned their attention to British India, and they were about to put their shoulders to the wheel to test the great question whether India had any capabilities by which an increased supply of cotton to this country could be obtained. The question had been very largely debated. It had been denied, on the part of the government of India, that there were capabilities for increased production, whilst others, equally well informed, had positively asserted that the resources of India in this respect were enormous. It appeared that at the present time great unanimity prevailed on two points; firstly, that India was the only country except the United States from which an increased supply of cotton could be looked for; and secondly, that it was only by the application of British enterprise and industry, that it could be developed. In the able paper brought before them that evening several causes had been assigned why the capabilities of India had not been more developed. He was sorry that some of the eminent personages connected with the government of India were not present on that occasion. He would have liked to have seen the Chairman of the Directors of the East India Company present that evening. He had also hoped to have seen his gallant friend Col. Sykes present, or at least some member of that administration, who might have dispelled any errors that prevailed on this question. The great question was, what were the causes which impeded the development of the resources of our Indian empire. The great cause was that the government of India had been controlled by a monopolising company, whose policy had been to keep down British enterprise and British colonisation in that country. He would call the attention of the meeting to an eastern country under good government, not a government of monopoly, but a government which encouraged British enterprise. He alluded to the colony of Ceylon. India, they were aware, at the present time presented a very unpleasant state of finance. In the last three years they had had a deficiency of £2,000,000 per annum. The taxation of the country could not be increased. Their frontier was extending, which necessitated the keeping up of a larger army, and there was this large deficit staring them in the face. Turning, however, to Ceylon, they found a soil very inferior to that of India—a soil which had never been able to feed its own population, which, he thought, was the most condemnatory remark which could be made of the soil of any country—peopled by a race inferior to the Hindoo in industry and intelligence; Ceylon, with a limited population, with a country overgrown with jungle; Ceylon, during the last 10 or 12 years that he had been acquainted with it, had made progress year by year, whilst India had remained stationary or had retrograded. He was in possession of a few statistics in illustration of this remark. In 1841 the exports of coffee from Ceylon were 41,000 cwt.; in 1855 they amounted to 506,540 cwt. The exports of Ceylon in 1837 were 308,000 lbs., and in 1855, 4,350,410 lbs. The imports in 1837 were 411,000 lbs., and in 1855, 1,457,770 lbs. The revenue of the island in 1837 was £371,994; and in 1855, £476,273, with an excess of revenue over expenditure of £70,162. In one country, therefore, they had an annual deficit of revenue, and in Ceylon, under the Queen's government, they had an excess of revenue over expenditure. If they asked him to what these results were attributable, he would say in the one instance to the encouragement given to British enterprise and the fostering hand held out by the government to the location of British capital there, and also to a wiser system of land tenure. Land had been sold, upon sound and honest principles, to Americans, French, Germans and English; and hand-in-hand with commercial improvement had gone on the advancement of morals in the country. Schools had been erected, good roads had been made; and in passing through the island, he had seen that which he had never seen in India—a respectable middle-class springing up, and villages of good and well-built houses, belonging to men who had made small fortunes under our rule; whereas in India, they might go from one end to the other and they would find but two classes—the rich money-lender, who had made his fortune, and the miserable cultivator, who lived under the cocoa-nut tree. If the association to which allusion had been made, went forward with the energy and perseverance which characterised the men of Manchester, they would insist upon British enterprise and capital being carried to that country; and when that was done it must be placed under the government of the Queen, for under no other government would British capital be trusted there. He might mention that at the present time, the merchants of Calcutta would not make a contract unless it were placed under the protection of the Queen's courts of law in India. He hoped it would be seen, from that day forth, that the Manchester men were forming a new organisation for the development of sound principles of trade, which would bring equal benefit to the people of India and the people of England.

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* *Theory and Principles of Railway Traffic in India.* Weale. 1845.

Dr. Livingstone said, although he was unacquainted with India, he could give them a little information with regard to Africa. The question of interest to the meeting this evening was the future supply of cotton. In Western Africa, they had cotton growing all over the country, cultivated by people who required no European superintendence. The small district of Angola, at the present time, yielded annually 1,200 cloths as tribute to the Government of Loando. This cotton was cultivated by the people, without superintendence save that of the collector, who came to collect the annual tribute. In that district, they saw the women with their spindle and distaff in their hands similar to those figured on the pictures of the Ancient Egyptians—with vessels of water on their heads—children at their backs, and spinning cotton whilst going to the field. The district of Angola possessed peculiar capabilities for the production of a very large amount of cotton. It produced it to some extent now, without any effort on the part of the Portuguese to promote it. It might be considered somewhat extraordinary that the Portuguese, knowing, as they must, the value of cotton, did not encourage the cultivation of it, and enrich themselves in that way; but the Portuguese were in India for about 120 years without knowing the great value of tea; so that they might be a longer time in Africa without knowing the value of cotton. Passing through the country towards the east, cotton was more or less cultivated, and the climate was moist, and would support vegetation throughout the whole of the year. It was not therefore open to the objection which had been raised against India. There were two rainy seasons during the year:—one when the sun was going south, and another when he came north. It occasionally occurred in Africa that there were years in which no rain fell. In a period of ten or twelve years there might be one year without rain, and any one traversing the country in such a year would no doubt find the vegetation parched up. The vegetation of that country was generally of an evergreen character. There were whole districts and forests of evergreens. In the centre of the country there was a grand system of rivers. There was a kind of basin in the centre of the country, into which streams from all directions flowed, so that there were abundant means of irrigation, and those rivers were not dried up during any portion of the year. South of the 20° S. lat. there was a somewhat different climate, and further north, approaching the equator, there was abundance of rain, and throughout the whole of that country a little cotton was cultivated. The cotton plant was to be seen around the habitations throughout the whole of the year, and as a little was grown he saw no reason why the quantity should not be increased. In the lower or eastern district of the Zambesi they cultivated cotton of two kinds; both, however, he believed, of an inferior quality—one requiring great labour to separate the pile from the seeds. This was done by means of iron rollers, and the natives made a little cloth from it. In Northern Africa he thought they had better prospects as regarded the cultivation of cotton than in the eastern part, but he could assert generally the capabilities of Africa for the production of cotton on a large scale. It was true at present that, if a person went up the Zambesi and expected to fill a ship with cotton, or with anything except hippopotami, he would be disappointed; but still the country possessed great capabilities for the production of this commodity. Cotton grew well there—indeed everything grew well. He thought Mr. Sharp was in error with regard to the habits of the African people. Mr. Sharp had alluded to their migratory habits, as an obstacle to the extensive cultivation of cotton in that country. He (Dr. Livingstone) was aware that the Bushmen were a very migratory tribe, but they were the only tribe that were so, and they were but a small fraction of the population of Africa. In coming down the Zambesi, he found the land on its bank for the most part portioned out, the little rivulets branching from the Zambesi in many cases forming the landmarks. Below the Loangwa, if a hunter killed an elephant on the banks of the river, he could not cut it up until the lord of the land was summoned to the spot, to claim his share of the spoil. The tusk which lay upon the ground, and the half of the carcase was claimed as the right of the holder of the land on which the animal had fallen, the upper portion of the animal only belonging to the hunter. So far from being migratory, the people had their gardens, and cultivated maize, and the soil was exceedingly fertile. On the other side of the Angola, descending the Valley of the Quango, the vegetation was so luxuriant that when he was riding upon an ox the grass would reach above his head, and he believed much of the fever that he suffered from arose from the frequent wettings he got from this tall and rank vegetation, in which a person might easily lose himself. So prolific was the vegetation of the country that he apprehended the chief difficulty in the cultivation of cotton would be to keep the plants clear of weeds. In the whole of that country cotton might be cultivated to any extent, but he thought there was a better prospect in Western than in Eastern Africa. The meeting would remember the Niger expedition, which went out about the same time that he started upon his travels. That expedition had an unfortunate termination, but he believed they were now beginning to reap some of the benefits of it. Missionaries had, for a long time, been labouring amongst the inhabitants on that coast, and the philanthropic Mr. Clegg was sending people into the interior, and he believed that in a short time they would have a large quantity of cotton produced there by free labour. But no like expedition ever went up the Zambesi. He, however, intended to go again in that direction, in the hope of spreading civilisation and Christianity amongst the people, and one of the first things he should do would be to distribute cotton seeds amongst the native chiefs. He did not suppose they would grow a bale of cotton in one year, or two years, or three years, but he should be content if once the cultivation could be started. If the people saw that they would gain a great advantage by largely cultivating cotton, he had strong hopes that they would do so, and by that and other means the country would be opened up to the influences of civilisation and Christianity. He might mention that his brother had travelled from America to England, in the prosecution of the same work. It was not a work that could be accomplished in one or two years, but if God spared his life and health, he hoped he might do something towards the attainment of that great object.

Lord Stanley, M.P., said they had listened to some valuable statistics of the cotton trade, and it might be interesting to them to know what was the effect upon the English community of a rise in the price of cotton of only a penny per lb. A rise in the price of a penny per lb. upon the 1000 millions of pounds consumed, caused a loss to the community of no less than between £4,000,000 and £5,000,000 sterling, or little less than the total amount of the income tax which they paid before the war. That was the first fact he would mention. The second fact was this: They had heard something about their dependence upon America for the supplies of cotton, but he did not think it had been remarked that that state of dependence not only remained as it was, but year by year was actually increasing. In 1801, of the total consumption of cotton in this country, they took 45 per cent. from the United States; a quarter of a century later, viz., in 1826, they took from the United States 72 per cent. of the total consumption. According to the last return, they were taking from the United States 80 per cent. What a bearing this had upon the slavery question in America. The cotton-growing states were those which lay along the northern shores of the Mexican Gulf. In those states there were, at the beginning of the present century, 220,000 slaves; they now amounted to 2,000,000, and it was computed that of the whole slave population of America, two-thirds were engaged in the production of cotton; and of the exports of the slave states, four-fifths consisted of cotton. He thought these simple facts would show the importance of even a trifling increase in the price of that commodity. He had shown them that their dependence upon the United States was increasing—how it affected this country, and gave a stimulus to the system of slavery. Now as to the remedy! He did not place much reliance upon the cultivation of cotton in the West Indies and some other parts that had been named. He thought they must look to India in the present, and to Africa in the future; of Africa he knew nothing, but with regard to the Indian question, he agreed with Sir Erskine Perry that great light was thrown upon it by the example afforded in the small community of Ceylon. Some years ago, he (Lord Stanley) was in Ceylon, and there had gone abroad an idea that the island was to be annexed to the territories of the East India Company, and he very well recollected the alarm and apprehension with which that idea was received. He thought they had better avoid the discussion of the Indian land-revenue question, as it was peculiarly complicated and perplexing. The two important points were—whether it was a good or tolerable state of things that a government should receive any rent from the soil of its territory. He did not suppose, as the land-tax yielded two-thirds of the revenue, that it would be given up; but the other question was, assuming that tax or rent of the land to continue, might it not be placed upon such a basis as to form a fixed instead of a fluctuating charge. With respect to the means of communication in India, it was almost impossible to exaggerate the present deficiency in that respect, or the development of the resources of that country which improved means of communication would produce. He was inclined to believe that where the nature of the country rendered it practicable, the most valuable of all communications was that of canals—for the reason that railways only served one purpose, whereas canals served both as a means of communication, and what in India was no less important—a means of irrigation. He was now rather speaking the views of Col. Cotton on this subject, with which he entirely agreed. In England they had a regular and perfect system of communication already established in the country. What the railways had to do was not so much to compete with the canals—although they did so to a certain extent—but rather to supply the means of rapid communication for passengers and light goods. In India, where there was an extent of country enormous in comparison with the area of our own island—the American system of railways would be more suitable than that adopted in this country—viz., railways of rough construction and of comparatively small cost, and intended for low speed. In America, in opening out a new tract of country, the practice was to lay down a railway as roughly and cheaply as they could, and to trust to the return which that imperfectly constructed line brought in for the means of ultimately completing it on a more perfect plan. It now only remained for him to perform the pleasing task which had been assigned to him, of proposing a vote of thanks to the hon. member for Stockport for his very valuable and instructive paper.

Sir John Pakington, M.P., rose for the purpose of cordially seconding the vote of thanks which had just been proposed by his noble friend Lord Stanley. The address with which the hon. member for Stockport had favoured them that evening involved a subject connected more than almost any other with the trade, the wealth, and the prosperity of the country. This most interesting subject had been brought before them under two aspects. The first was that it was neither desirable nor right that this country should be dependent for the means of carrying on so gigantic a branch of trade upon the United States or upon any one country. The second aspect in which it was presented to them was this, that even if they had no objection to being dependent upon the United States for the supply of cotton, so great was the increase of that manufacture, that it became every year more and more doubtful whether the United States, even with slave labour and all its advantages, could supply the demand. It was quite clear, from the statement of the hon. member for Stockport, and also from the interesting remarks of Dr. Livingstone, who was so well acquainted with Africa, that they might entertain a reasonable hope of seeing the free negro in the West of Africa, competing in the production of this article with the slave negro in the United States. He thought that was a most interesting consideration, as it might lead to a better fulfilment of those grave responsibilities which England had undertaken in her government of India. He would not trespass upon their attention farther than to express a hope that the very instructive paper they had heard, would be published and widely circulated. What had passed that evening had convinced him that it might promote the interests of this country and the interests of India, if this important question could be made the subject of discussion in Parliament. There were many hon. members of the house who were qualified to undertake the commencement of such a discussion, and he thought it would prove most beneficial to the interests of the country that the subject should be brought before the House of Commons; he could say for himself, what he believed he might state with equal confidence for all present, that he had listened to these proceedings with the greatest interest, and a feeling of gratitude to the hon. member would induce them all to concur in the vote of thanks to him, which he begged cordially to second.

Mr. Crawford thought the capacity of India for the supply of cotton had been overrated, whilst that of America had been underrated. They had heard that some 70 years ago the supply of cotton from America was only 5,000 bales per annum; now, it amounted to 3,000,000 of bales, and the price of cotton had fallen from 1s. 10d. to 8d. per lb. Another fact was, that, for the last seven years, there had been no important or considerable rise in the price of cotton or cotton manufactures, whilst a rise had taken place in almost every other article; indeed, in some branches of the cotton manufacture there had been a fall to the extent of 25 per cent. He believed there was no risk of the falling off in the supplies of cotton from America for centuries to come: he most heartily wished it could be obtained otherwise than by slave labour. The £38,000,000 of exports of cotton manufactures, and even more than that amount, including the home consumption, depended upon slave labour; but for that the greatest manufacture of the world could not exist. With regard to India, it was to be remarked that it was itself a great cotton consuming country, and in the most populous parts enough was not produced for the demand. Then, again, there was China, which would be a large consumer of the cotton of India, and along the whole valley of the Ganges they had competitors for the supply of it. He agreed with the noble lord who had spoken, that canals were the most desirable means of communication in India, and he did not anticipate that any large supplies of cotton would be brought to the coast by railway. America possessed great natural advantages over India, particularly in her rivers which never dried up, besides being so much nearer to this country. He believed, at the same time, that many parts of India were capable of producing a large amount of cotton, but they could not look for a surplus production where the home consumption was so extensive.

Mr. Montgomery Martin said that, notwithstanding the remarks of the last speaker, there was no doubt in his mind that the greatest cotton-producing country in the world was India, and he believed that the resources of that country must eventually be developed by British capital and enterprise. Although America might now be thought capable of yielding an inexhaustible supply of cotton, yet in the present state of the slave question, that country might be regarded as being on the edge of a volcano. The development of the resources of India, of which cotton formed but one element, was an important question. He then adverted to the contrast between the condition of the presidency of Madras, under the fostering hand of the Marquis Cornwallis, and the lamentable results which the adoption of different principles had produced in the other presidencies. The miseries endured were not the inflictions of Providence, but were the results of the cupidity of man.

A vote of thanks was then passed to Mr. J. B. Smith.

The Secretary announced that on Wednesday evening next, the 20th inst., a paper "On the Brussels Congress of 1856, and its bearing on the progress of International Commerce," by Mr. Thomas Winkworth, would be read. Mr. William Brown, M.P., will preside.

The Secretary has received the following communication since the meeting:—

"Sir,—The importance of the subject discussed last evening cannot be over-rated, whether considered in any of its various aspects—economical, commercial, manufacturing, shipping, or national. Its general interest was well exemplified by the influential and leading individuals present, and taking part in the discussion. The debate was prolonged to so late an hour that, even after the many interesting speeches made, much was left unsaid for want of time.

"Attention was chiefly concentrated on India, under the impression that from that quarter more immediate supplies can be obtained than from others.

"But, in the urgency of the present wants of our mill-owners and spinners, prospective supplies should not be overlooked. It has been too much the fault of the Lancashire manufacturers to defer all thought for the future until absolute dearth exists; and, as a consequence, should any crisis arise in the slave States, any failure of the crops occur, or any extraordinary demand come forward from the Continent, absolute ruin would stare them in the face, and a large number of our industrious population be thrown out of employ.

"Incidental mention was, indeed, made of other quarters, as probable producers of cotton, but extensive production in India was looked forward to as certain to meet all the wants. Without denying that there is ample room for extended culture and production of a second-rate class of cotton in many parts of our great Indian empire, the other sources of supply should not be altogether overlooked. With the increased stimulus of higher prices, India has increased her supply of cotton for our mills from 309,500 bales, in 1850, to 464,000 bales, in 1856. The demands of our mill-owners have rapidly outstripped supplies, and we could, as was well observed, use up double the quantity we now obtain, owing to improved machinery; and, even now, the construction of new mills is stayed, owing to the impossibility of obtaining the raw material in sufficient quantity.

"In the last ten years our weekly consumption of cotton wool has doubled, having increased from 21,269 bales to 43,478 bales per week, and the deficiency of stock is even greater than was stated by Mr. Smith. Instead of having 23 weeks' consumption in hand at the beginning of the year, according to the trade circular of Messrs. Hollingshead, Titly, and Co., we had less than 12 weeks' consumption. And it should be borne in mind that the demand for the raw material for manufacture and consumption has increased in all countries to an extent almost commensurate with our own, while the production with forced labour in the chief seat of production cannot be very greatly extended.

"If we glance at the comparative consumption now and 20 years ago, we shall see the progress of cotton manufactures respectively in the principal nations. The consumption in millions of pounds was respectively—

	1837.		1856.
Great Britain	369	...	920
Russia, Germany, Holland, and Belgium	58	...	256
France and adjacent countries	121	...	211
Spain	none	...	48
Countries bordering on the Adriatic ...	32	...	39
United States	82	...	265
Other countries	—	...	56
	662		1795

"From these figures it will be seen that relatively the demand and consumption have been greater in very many countries than in our own, and that they are outbidding us by competition, and raising the price of the raw material. Our aggregate consumption during a series of years, extending from 1821 to 1855, was given by Mr. Sharp, but a comparison of our imports 50 years ago with what they are now, will show the immense magnitude of the interests at stake, and the enormous increase that has taken place. The imports from the several quarters are indicated as below:—

	1806.		1856.
United States	125,000	...	1,758,295
West Indies	78,000	...	11,320
Brazil	51,000	...	122,411
East Indies	7,800	...	463,932
Other sources	—	...	111,960
	261,800		2,467,918

"But the size of the packages has also increased proportionately, owing to improvements in pressing and packing, to diminish expense in bagging and freight.

"In the early part of the century, the United States bale was computed at only 200 lbs.; last year the average weight of all was 407 lbs.

"The cotton crop of the United States last year was upwards of 3½ million bales, and taking these bales at the average of 400lbs., with a rough estimate of price of 6d. per pound, we have a total value of £35,000,000 sterling for this one staple.

"The figures given above show the variations of supply, and bring me to the subject of where the production can be stimulated. We see from these that the West Indies, including British Guiana, then furnished us with something like 23,000,000 lbs. of cotton, and if we turn to Bryan Edward's history, or to the more recent work of my friend Mr. Montgomery Martin, who spoke on the subject last night, we shall find that almost every one of our dependencies in the West produced and exported cotton; other staples then came into higher demand, sugar, coffee, cocoa, &c., were found to be more remunerative, and cotton culture was given up. But with a proper adjustment of the labour question, and the extended privilege of importing free labour from Africa and the East, there is no reason why British Guiana and the West Indies should not again supply us with large shipments of excellent cotton. Dr. Livingstone pointed out very forcibly how much could be done in Africa with Chinese labour. I also believe large supplies might hereafter be obtained in the Moreton Bay district and some others part of Northern Australia. When Zulu labour becomes more continuously available, there is no reason why cotton culture should not be remunerative in Natal. The French are pushing the cultivation in Algeria; and in the Neapolitan countries, and other parts of the Mediterranean, prominent attention is being directed to it.

"In corroboration of the remarks made as to the progress under free sales of land in Ceylon, I may instance Mauritius, where sugar production has been immensely extended under even greater disadvantages of soil and labour, &c., than existed in Ceylon.

"The Association formed by the Manchester manufacturers should not be content with the mere discussion of the subject in commercial and political channels here. The assistance of the Indian and colonial press should be enlisted, and the facts of the demand for cotton fully stated in the channels where the remedy could be best applied. Circulars, seed, &c., should be forwarded, not only to the leading agricultural societies, merchants, planters, and chambers of commerce in our possessions, but to those of foreign countries with climates suited to the culture, as well as to our own consular representatives, and to any active and zealous individuals abroad.

"These efforts would ultimately bring forth abundant fruit, and the production would be vastly stimulated. I cannot trespass further now on space in the *Journal*; but the subject of cotton culture should be fully ventilated and discussed, being one of those falling properly within the scope and special objects of the Society.

"I am, &c.

"P. L. SIMMONDS.

"3, Winchester-street, Pimlico, May 14."

Home Correspondence.

BLACK-BONED FOWLS.

SIR,—"Travellers' tales" have always been more or less doubted. Why they should be, I am unable to say. Perhaps that doubt may have had its origin in the natural disposition of the human mind to reject everything to which it has been unaccustomed, or perhaps in the knowledge that there is implanted in the breast of every man a love of exciting surprise and astonishment in his fellow men, and an aptness to seize every opportunity which presents itself of producing those emotions. I believe few persons are free from this weakness, and it must be acknowledged that we feel a positive pleasure, and are conscious of a certain superiority, when we are the first to relate to a gaping auditory some marvellous event, or even some circumstance of no very extraordinary description, but which was not known until we had the happiness to communicate it. It matters not whether it be a joyful or melancholy event, out it must come—the bosom labours to be delivered of it. If it be the former, it is accompanied with a smile, and an expression of satisfaction; if the latter, it is garnished with the necessary shake of the head, and the appropriate sigh, with the exclamations of Poor fellow! Sad thing! Very melancholy! It is this feeling which has no doubt frequently induced persons who have travelled in distant and comparatively unknown countries to give exaggerated accounts of what they have seen, and sometimes to state with confidence—there being little fear of contradiction—what they have not seen.

I have been induced to make these observations in consequence of a statement which I made having been received with incredulity. I, sometime ago, had the honour of describing to you a particular kind of bird which existed in Honduras, which description you communicated to some eminent ornithologists—who they are I do not know—and they entirely disbelieved it. They say they never saw such a thing, never heard of such a thing, ergo—such a thing cannot be. If we were all to proceed upon this principle I fear that our knowledge would be very circumscribed. However, as the statement which they so unceremoniously contradict is perfectly true, I now forward it to be printed in your journal, and let the sceptics deal with it as they think proper.

There is in Honduras a fowl of the gallinaceous kind, a native of Peten and Yucatan, every bone of which is quite black. The legs, the pinions, the breast, the backbone, are all as black as ink. They are distinguished by their black combs and gills. Their feathers are generally black, and also their feet; they are neither larger nor smaller than other fowls; the flesh is perfectly white, and remarkably juicy and well flavoured. When I first saw one of these animals in the shape of a very savoury stew, I was not a little alarmed at the sight of the black bones, and I rashly accused the cook of having served up a diseased hen. Miss Mary Gordon, the artiste, one of those everlasting brown women, with nerves of wire, and skins of India rubber, repelled the charge with indignation, and explained to me the real state of the case. "Dat hen no sick, sar. Dat hen berry good, sar. Him de black-bone fole,—him more betterer dan de oders. Sick hen, hi! you nebber eat anyting like him in England, sar. Sick, hi! dat hen make you fat, sar." In reply to a note upon this subject, which I wrote to Mr. Vaughan, a gentleman who resided for many years in various parts of Central America and Yucatan, I received the following letter:—

"Chandos-lodge, Wimbledon, May 12, 1857.

"MY DEAR SIR,—In reply to your note, I beg to say that I have both seen and eaten black-boned fowls. They are known from their having black combs and gills. The plumage of those I have seen has been black. They come from Yucatan and Peten. They are about the same size as the ordinary fowl. The meat is quite white, and, if anything, more delicate than that of other fowls. Hoping you are well, I am, my dear Sir,

"Your's truly,

"WM. VAUGHAN.

"R. Temple, Esq."

I have very closely examined, and have bred these fowls, and I have arrived at the clear conviction that the blackness of their bones does not arise from any accidental circumstance, but that it is a permanent feature belonging to a distinct species. I shall not fail to introduce the breed into this country.

I am, &c.,

R. TEMPLE.

May 13th, 1857.

THAMES EMBANKMENT.

SIR,—It is very gratifying to find my general suggestions for metropolitan improvements supported and approved by an engineer so eminent as Mr. Bridges Adams, whose knowledge of the question is derived from careful study. It may seem presumptuous in me to differ from him on a subject demanding engineering skill; nevertheless, I cannot agree with him on all points, and I therefore beg to offer a few words in reply to his letter which appears in the *Journal* of this day.

Mr. Adams objects to my giving an "arbitrary width of sixty feet for the gauge of streets, because I omit the height of buildings." If he refers to my paper again, he will find that I confine the scope of my paper to the accommodation necessary for *traffic.* He will find, also, that I consider sixty feet as the minimum width of a first-class street, and give conclusive reasons for its general adoption. Should the height of houses continue to increase, it may become necessary to widen the streets so as to admit of light and ventilation. Wherever increased width could be secured without any considerable additional expense, I should like to see seventy feet secured—forty-six feet for vehicles, and twelve feet on each side as a footway.

Mr. Adams objects to my scheme for the embankment of the river, because it would "diminish the air space—the lungs of London," and "the river is the largest lung of all." Now there are healthy lungs, and there are diseased lungs. If the open area surface is slightly narrowed by my plan—and it is but slightly—the healthiness is increased immensely. Wherever gardens are in existence now, they are not only to be retained but greatly enlarged, while an entirely new one is suggested in front of Somerset House.

The whole of those reeking hot-beds of disease, that bare their backs at every ebb-tide from Waterloo-bridge to Whitehall-gardens on both sides of the Thames, would be covered in and rendered innocuous. I had imagined that Dr. Letheby's excellent remarks on the sanitary advantages of my plans, had settled that point. My study was to increase the comforts and pleasures of the people, without diminishing their convenience, or interfering with the rights of traders along the shore. In this I think I succeeded; wherever a wharf privilege exists, or a river privilege is possessed, the owner should have a pre-emptive right to claim a like area along the new frontage, or receive an equivalent in the shape of compensation. London is a trading city, and from its trade its wealth has sprung. The convenience of that trade must be consulted in every scheme connected with the improvements of the river. Private rights always receive at the hands of the legislature the fullest consideration, and public rights are seldom overlooked. The minister is not born who would venture to propose any plan for the embankment of the Thames that will lessen its trading advantages.

To an arcadian imagination it may be all very well to think and write of "fountains, flowers, and shady bowers," but, I confess, I am surprised to find the practical mind of Mr. Adams made captive by the poetical. "Beautiful promenades at a small expense" are luxuries not to be despised, but loungers and nurse-maids have only to cross the road from Northumberland-wharf, and they will find themselves within the pleasant "*lung*" of St. James's park, to frolic as they will. But to convert the river frontage from Northumberland-wharf to Waterloo bridge into a pleasure garden, is a scheme that never will be tolerated.

I have done something towards keeping the area near St. Paul's open, and I trust that permission to cover it over will never be obtained. I have likewise done something in preventing (and denouncing when attempted) encroachments on the river, and I have always advocated the retention of open spaces, whether within the City or in the suburbs of the metropolis, as essential to the health of the population. Whether Mr. Rammell's plan of "lamp-post railways" will be improved by the suggestion of Mr. Adams, is exceedingly doubtful. His double row, one on each side of the street, united by girders, and shops taken to the first-floor, might double the street accommodation, but it would in all probability quadruple the inconvenience now complained of.

Should Mr. Adams find time to again consider the scheme I advocate for the embankment of the river, and always keep in mind that trade has to be accommodated, and must not be sacrificed to the claims of elegance and beauty, I am persuaded he will come to the conclusion that, so far, no system has been suggested so likely to meet every requirement. Any lofty embankment, so properly objected to by Mr. Adams, is not intended. Nor will there be a dead ditch, like the Liffey at Dublin. The volume of water in the Thames and the great current of the tides prevent that; nor can we ever have the sluggishness of "a Dutch or Venetian canal."

The docks "between lofty piles of buildings," need not necessarily be converted into loathsome pools. If the entire scheme is executed such a result will be impossible. The great idea was to suggest a plan by which the health of the neighbourhood would be improved, the traffic on the river and along its banks facilitated, and the architectural character of the metropolis advanced. In a word, the wish was to marry utility to beauty; and this "consummation so devoutly to be wished," has been, I think, accomplished.

I am, &c.,
FRANCIS BENNOCH.

77, Wood-street, City, 8th May, 1857.

To Correspondents.

Errata.—In last number of Journal, page 257, col. 2, line 43, for "Allenheads, Thomas Sopwith," read "Thomas Sopwith, Allenheads." Page 358, col. 1, line 51, for "Creed, W., 53, Conduit-street," read "Creed, H., 33, Conduit-street."

PARLIAMENTARY REPORTS.

SESSIONAL PRINTED PAPERS.

Delivered on March 22, 26, 28, 30; *April* 3, 7, 10, 18, 23, 25, 28, 30.

Par. No.
110. Flogging (Army)—Return.
127. East India (Police System, Bengal)—Copy of a Despatch.
135. Russian Medical Department—Report.
139. Wheat, &c.—Return.
129. Queen's Colleges (Ireland)—Return.
130. National Education (Ireland)—Return.
145. Immigrants and Liberated Africans—Return.
150. Licensed Passage Brokers, &c. (Liverpool)—Return.
42 (2). Trade and Navigation Accounts (28th February, 1857.)
70. Assurance Companies—Return.
77. Surrey Lunatic Asylum—Copies of Communications.
101. Army, &c., Examinations—Return.
143. Income-tax—Return.
119. Poor Law—Return.
98. Land Transport Corps—Copy of Instructions.
111. East India (Bengal)—Copy of a Despatch.
116. Emigration (Australia)—Returns.
121. Iron, &c.—Return.
137. Poor Relief—Return.
146. Victoria (Australia) Electoral Law—Copy of.
122. Printing—Report from the Select Committee.
152. National Collections—Return.
155. Parliamentary Papers—Return.
142. Trees (Ireland)—Abstract of Return.
17. River Thames—Report by Commander Burstal.
99. Statute Law Commission—Report from Committee.
147. Chinese Emigrants—Copies of Communications.
156. Highland Roads and Bridges—43rd Report of Commissioners.
93. Contracts for Public Departments—Report from Committee.
120. Customs Tariffs—Return.
79. East India (Roads)—Return.
118. Ameer Ali Morad—Papers.
138. Gas Works—Abstract of Return.
153. Reformatory and Industrial Schools—Returns.
44 (3). Trade and Navigation Accounts (31st March, 1857).
144. Emigration (Australian Colonies)—Return.
157. Schools of Art—Return.
132. Works and Public Buildings—Abstract Accounts.
Prisons—22nd Report of the Inspectors (Scotland), Part 4.
China—Correspondence respecting Consular interference for the prevention of Smuggling.
Canton (Naval Forces)—Further Papers.
Statistical Abstract for the United Kingdom (1842 to 1856).
Code of Signals to be used at Sea—Report.
Metropolitan Water Supply—Dr. Hassall's Report.
Post-office—3rd Report of the Postmaster-General.
National Education in Ireland—22nd Report, Vol. 2.
Medical Charities (Ireland)—5th Report of Commissioners.
Morocco—Convention of Commerce and Navigation.
Morocco—General Treaty.
Public General Acts—Cap. 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17, 18, 19, 20, and Table.

MEETINGS FOR THE ENSUING WEEK.

Mon. Architects, 8. Mr. M. D. Wyatt, "On the Sacred Grotto (Sacro Speco) of St. Benedict at Subiaco, and its Monastic Institutions."
Chemical, 8. Mr. Crace Calvert, "On the Manufacture of Iron." Mr. G. B. Buckton, "On the Oxidation of Chinese Wax."
United Service Inst., 8. Capt. Baillie, "On Military Surveying and Reconnaissance."

Tues. Pharmaceutical, 12 (noon). Anniversary.
Royal Inst., 3. Dr. J. P. Lacaita, LL.D., "On Italian Literature—Historians of the *Cinquecento*."
Civil Engineers, 8.
Pathological, 8.
Statistical, 8. Mr. F. Hendriks, "On the Land-tax Statistics of England, and the Political Arithmetic of the early period of its settlement."

Wed. London Inst., 3. Prof. Robert Bentley, "On Systematic Botany, with especial reference to the natural systems of arrangement."
Society of Arts, 8. Mr. Thomas Winkworth, "On the Brussels Congress of 1856, and its bearing on the Progress of International Commerce."
Geological, 8. Prof. Owen, "On the new Fossil Mammal from the London Clay."
Royal Soc. Lit., 8½.

Thurs. Royal Inst., 3. Prof. J. Tyndall, "On Sound, and some associated phenomena."
Numismatic, 7.
Antiquaries, 8.
Philological, 8. Anniversary.

Fri. United Service Inst., 3. Mr. Craufurd, "On China and the Chinese."
Royal Inst., 8½. Mr. E. Vivian, "Aerial Phenomena, from observations and sketches taken during a Balloon Ascent."

Sat. Asiatic, 2. Anniversary.
Royal Inst., 3. Prof. E. Frankland, "On the Relation of Chemistry to Graphic and Plastic Art."
Royal Botanic, 3¾.
Medical, 8.

PATENT LAW AMENDMENT ACT.

APPLICATIONS FOR PATENTS AND PROTECTION ALLOWED.

[*From Gazette, May* 8.]

Dated 2nd April, 1857.

912. François Auguste Laurecisque, 39, Rue de l'Echiquier, Paris—An improved system of constructing dissected maps or charts.
914. Richard Husband, Manchester—Certain improvements in the manufacture of hats and other coverings for the head, and in the instruments employed in the said manufacture.
916. Duncan Morrison, Bordesley Works, Birmingham, and Samuel Lilley, Birmingham—An improvement or improvements in locks.
918. Robert Otway, Lambeth—An improvement in scythes.
920. Richard Archibald Brooman, 166, Fleet-street—A steam windlass and boiler for the same, together with certain modifications to enable the windlass to be worked by hand. (A communication.)

Dated 3rd April, 1857.

922. William Hardman and James Dugdale, Farnworth, near Manchester—Improvements in machinery for preparing cotton, flax, wool, or other fibrous materials.
924. William Holland, Birmingham—A new or improved manufacture of runner notches and top notches for umbrellas and parasols.
926. William Henry Taplin, London—Improvements in the construction of fire-places and stoves.
923. John Smith, Bradford—Improvements in machinery or apparatus used in the manufacture of brushes for flour-dressing machines.
930. Arthur Paget, Loughborough—Improvements in machinery or apparatus for the manufacture of looped fabrics, and in the manner of constructing the same.
932. Thomas Whitehead, Leeds—Improvements in spinning flax, tow, and hemp.
934. John Henry Johnson, 47, Lincoln's-inn-fields—Improvements in the treatment of floss silk. (A communication.)

Dated 4th April, 1857.

936. Joseph Ferdinand Toussaint, Brussels—A method for facilitating the examination and discovery of fissures, flaws, or deteriorations in the inserted or hidden parts of axles or other like pieces of machinery subject to decay and rupture.
938. George Spencer, 6, Cannon-street West—Improvements in machines used for facilitating the discharge of coals, minerals, earths, and other similar materials, from waggons used on railways, tramways, and common roads.
940. Elkan Adler, New York, and Robert Parker Abernethy, Cincinnati, U.S.—Improvements in machines for cleaning knives and other similar articles.
942. Charles Renshaw, Dukinfield, Chester—Improvements in self-acting differential valves.
944. James Milnes and Frederick William Mowbray, Bradford—Improvements in lubricating the pistons and valves of steam engines.
946. Job Mead and George Mead, Bethnal-green—Improvements in metallic and other packing boxes or cases.
948. John Henry Johnson, 47, Lincoln's-inn-fields—Improvements in the manufacture of hard india rubber. (A communication.)
952. John Penford Harvey, Spalding, Lincolnshire—Improved machinery for crushing land or clods.
954. William Perks, junr., Birmingham—A new or improved manufacture of crown and sheet glass.
956. John James Rippon, Oakenshaw Print Works, near Accrington—An improvement or improvements in rollers or cylinders for printing fabrics.

Dated 6th April, 1857.

960. Charles Burrell, Thetford—Improvements in portable steam engines suitable for agricultural purposes.
968. Louis Jean Marie Siblet, 39, Rue de l'Echiquier, Paris—An improved pulp for the manufacture of paper.

Dated 7th April, 1857.

970. Ebenezer Rogers, Abercarn, Monmouth—Improved methods of applying fuel for heating purposes.
972. James George Hunt, Cincinnati, U.S.—Improvements in fences and gates.
974. George Pearson, Oldham, and Edward Jessop, Manchester—Improvements in sewing machines.
976. John Robinson, Glossop, Derbyshire—An improved apparatus for driving or giving motion to power looms, which said improvement is also applicable to driving other machinery.
978. Charles Cochrane, Ormesby Iron Works, Middlebro'-on-Tees—An improvement in the heating of the blast for blast furnaces.

Dated 8th April, 1857.

982. Barnabas Taylor, Cranbrook, Kent—An improved arrangement of combined bed and utensil for the use of invalids.
984. Robert Kanzow Bowley, Charing-cross—Certain improvements in boots and other similar coverings for the feet.
986. Martin Billing, Birmingham—An improvement or improvements in the manufacture of metallic cornice ends.
988. Alfred Francis, Encomb-terrace, Wandsworth-road—Improvements in fastening shutters and doors.
990. Charles Tilston Bright, the Cedars, Harrow Weald—Improvements in laying down submarine telegraph cables and in apparatuses to be employed therein.
992. Jasper Wheeler Rogers, Peat-house, Roberts-town, Kildare—Improved means of, and apparatus for, collecting for use the excrement of towns and villages, and for facilitating the drainage of houses generally.
994. Alfred Vincent Newton, 66, Chancery-lane—Improvements in hand bullet moulds. (A communication.)

Dated 9th April, 1857.

996. Edgar Brooks, Birmingham—Improvements in the manufacture of fire-arms.
998. William Oxley and Hugh Strath, Manchester—Improvements in lubricators.
1000. Thomas Rolfe, Regent-street—Improvements in pianofortes.
1002. Henry Thompson and Henry Walmsley, Great Harwood, near Blackburn—Improvements in looms for weaving.
1004. Charles Frederick Bielefeld, Wellington-street, Strand—Improvements in preparing the surfaces of slabs or sheets made of fibrous and cementing materials.
1006. George Edward Taylor, Oatlands mill, Leeds—An improvement in raising and shearing cloths.
1008. Robert Turnbull, Harwich—Improvements in slips or ways for heaving up and moving ships, and in cradles for the same.
1010. John Leach, Over Darwen, Lancashire—Improvements in looms for weaving.
1012. John Coope Haddan, Cannon-row, Westminster—Improvements in the manufacture of, and in the means of, and apparatus for, discharging projectiles.

Dated 11th April, 1857.

1016. William Smith, 10, Salisbury-street, Adelphi—A universal Jacquard apparatus. (A communication.)
1018. Charles Smith, Holloway—An apparatus to be used in connection with certain domestic utensils.
1020. Henry Félix Courenq, Toulouse—Improvements in machinery for ruling paper.
1024. Richard Archibald Brooman, 166, Fleet-street—Improvements in the distillation and rectification of spirits, in apparatuses employed therein, and in the preparation of the substances to be distilled. (A communication.)
1026. William Gresham Wiles, Lady's-well Brewery, Cork—Improvements in brewing.
1028. Thomas Nathaniel Pengelly, Gloucester street, Commercial-road East, and George Porter, Mary Ann-terrace, Abbey-street, Bethnal Green-road—Improvements in the application of steam to lifting or hoisting coals and other goods from ships' holds.
1032. Thomas Robert Winder, Dover—An improved mode of constructing submarine works.
1032. Henry Adcock, City-road—Improvements in steam-boilers.

Dated 13th April, 1857.

1034. Thomas John Searle, Portland-wharf, 74, Wapping-wall—Improvements in fastenings for window sashes.
1036. Thomas Richardson and Edmund John Jasper Browell, Neville Hall, Newcastle-on-Tyne—Improvements in treating old or waste railway wood sleepers and bearers, and in preparing or preserving wood for railway sleepers and bearers, and other works.
1038. Charles Goodyear, Leicester-square—Improvements in the manufacture of life-preserving apparel and other buoyant pliant articles.

1040. Augustus Edward Schmersahl, Miles Platting—Improvements in treating bones for the purpose of obtaining gelatine, size, or glue, and in obtaining certain useful products from such treatment.

1042. Richard Archibald Brooman, 166, Fleet-street—A method of and apparatus for disinfecting alcohol, or for separating essential oils therefrom. (A communication.)

1044. Thomas Greville Potter, 531, New Oxford-street—An apparatus for day and night advertising.

Dated 14*th April*, 1857.

1048. Robert Hazard, 1, Thanet-place, Strand—An improved heat-extractor.

1050. Charles Jean Marie Lavigne, Paris—Improvements in machines or apparatus for swinging, see-sawing, revolving, and for performing other exercises or amusements in the air.

1052. Thomas Harrison, Nebthwait Mills, Lancashire—New or improved machinery for the manufacture of wooden pill-boxes, match-boxes, and other such-like articles.

1054. Benjamin O'Neale Stratford, Earl of Aldborough, Stratford Lodge, Wicklow, Ireland—Improvements in aerial navigation, and in the apparatus connected therewith, parts of which are applicable to locomotion generally.

1056. John Henry Johnson, 47, Lincoln's-inn-fields—Improvements in apparatus for generating and superheating steam. (A communication.)

1058. John Henry Johnson, 47, Lincoln's-inn-fields—Improvements in fire arms. (A communication.)

1060. William Edward Newton, 66, Chancery-lane—Improved means of lighting gas for illuminating and other purposes. (A communication.)

Dated 22*nd April*, 1857.

1127. William Steel, Glasgow—Improvements in discharging ashes from steam boats.

1131. William Ogden and Henry Firth, Bacup—Improvements in fans or blowing apparatus.

1133. John Henry Johnson, 47, Lincoln's-inn-fields—Improvements in sewing machines. (A communication.)

1135. Gerolamo Cavanna, Genoa—Improvements in obtaining motive power.

1137. Charles Etienne Osmont, 22, Rue Neuve Coquenard, Paris—Improvements in penholders.

1139. William Rutt, 11, Sutton-place, Homerton—Improvements in microscopes.

Dated 23*rd April*, 1857.

1141. George Welch, Birmingham—Improvements in metallic pens and penholders.

1143. Matthew Dunnett, Glasgow—Improvements in embroidery or sewing, and in machinery or apparatus connected therewith.

1145. David Milnes, Bradford—An improved manufacture of woven goods or fabrics.

1147. James Taylor, Cullen, Banff—Improvements in apparatus for producing fire and light.

1149. Jaques Richard, near Melun, France—An improved agricultural machine for cleaning grains.

1151. George Wright, Sheffield—Improved apparatus for heating.

1153. William Colborne Cambridge, Bristol—Improvements in chain harrows.

1155. Andre Prosper Rochette, Brighouse, Yorkshire—An improvement in currying leather.

1157. Andre Prosper Rochette, Brighouse, Yorkshire—Improvements in currying leather.

Dated 24*th April*, 1857.

1159. Lieut. Edward Manico, R.M., Bucklersbury—Improvements in obtaining foundations for marine or other structures.

1161. Jean Baptiste Bellon, Moorgate-street-chambers—Improvements in mordants for use in dyeing processes.

1163. James Caddick and Thomas Hemmings, Garndyn's Iron Works, and David Caddick, Ebbw Vale Iron Works, near Newport, Monmouth—Improvements in puddling and balling furnaces for heating and melting iron or steel.

Dated 25*th April*, 1857.

1165. Samuel Walmesley, Stockport—Certain improvements in machinery for preparing and spinning cotton and other fibrous materials.

1167. Samuel Sunderland and Richard Dean, Burnley—Improvements in looms.

1169. William White, Adelaide-street, South Shields—Improvements in making moulds or matrices employed in casting metals.

1171. James Simpson and Edwin Rimmer, Manchester—A certain improvement in Venetian blinds.

1175. Rev. James Burrow, Ashford Parsonage, Bakewell—Improvements in coating wrought iron.

1177. Joseph Belshaw, Nottingham—Improvements in manufacturing knit fabrics.

Dated 27*th April*, 1857.

1179. Amable Victor Felix Larchier, Paris—Improvements in the manufacture of gas. (A communication.)

1181. Polydore de Keyser, 24, Cannon-street West—An apparatus for preventing horses slipping. (A communication.)

1183. Edmund F. Barnes, New York—Improvements in telegraphic instruments, and called an "Embossing Telegraph."

1185. John Macintosh, Euston-place—An improvement in the manufacture of air-beds, cushions, and other like inflated and fluid-tight apparatus or bags.

1187. Thomas Dickason Rotch, Surbiton, Surrey—Certain new and useful improvements in gas generators. (A communication.)

1189. Julien Billiard, 20, Red Lion-square—Improvements in the arrangments and construction of furnaces and other fireplaces. (A communication.)

Dated 28*th April*, 1857.

1191. James Withnall, Manchester—Certain improvements in the manufacture of rollers or cylinders to be employed for printing calico and other surfaces.

1193. James Barker, Blackfriars-road—An improved propeller for ships and vessels.

INVENTIONS WITH COMPLETE SPECIFICATION FILED.

1224. George Tomlinson Bousfield, Loughborough-road, Brixton—Improvements in collapsible boats and pontoons. (A communication.)—30th April, 1857.

1266. Robert William Sievier, 8, Rue du Cerf, Brussels—An improvement in the mode of treating saccharine juices in the manufacture of sugar.—9th May, 1857.

WEEKLY LIST OF PATENTS SEALED.

May 8th.

2643. William Stones.
2648. William Smith.
2649. John Fell Jones.
2659. William Lukyn.
2660. George Islington Bache.
2661. William Weild.
2675. Alexander Hutton.
2576. Thomas Stephen Holt, Edward Earnshaw, and Jas. Barlow.
2698. James Greaves.
2713. Alexandre Marie Joseph Eeckman.
2719. John Wilson.
2752. Richard Eaton.
2779. William Edward Newton.
2792. Henry Bragg, jun.
2800. John Brown & John Adin.
2807. Asa Lees and David Schofield.
2816. Camille Auguste Tissot.
2842. George Julius Vertue.
2864. Frederick Albert Gatty.
3029. William Henry Stratton.
3086. Wm. Renwick Bowditch.
186. Henry Medlock.
256. Arthur Clark.
290. Henry Whittles and Robert Schofield.
369. Charles Tutner and Louis Watermann.
453. Alexander Parkes.
492. Peter Cato and Joseph Betteley.
630. Rudolph Bodmer.
640. William Frederick Taylor Bradshaw.
697. Johannes Neuenschwander.
719. Thomas Horne, jun.
755. George Forsyth.
761. James Murdoch.

May 12th.

2662. Joseph Eccles.
2695. Christopher Binks.
2732. John Lord.
2750. Robert Brock Benson.
2766. Charles Garton and James St. John Gage Parsons.
2806. Henry Eastman Palmer.
2826. William Johnson.
2968. George Littlewood.
118. William Edward Newton.
192. Carl Christian Engstrom.
314. George White.
478. John Moule.
654. George Tomlinson Bousfield.
735. William Pidding.

PATENTS ON WHICH THE STAMP DUTY OF £50 HAS BEEN PAID.

May 4th.

1007. Adrien Georges Amant Martin and Casimir Lefol.
1024. Julian Bernard.
1031. Theodore Lemielle.
1055. John Platt.
1140. Robert Oram and William Oram.

May 5th.

1014. Bernard Joachim La Mothe.
1015. Josiah George Jennings.
1016. Bernard Joachim La Mothe.
1019. Richard Waller.
1051. Warren De la Rue.
1052. Henry Doulton.

May 6th.

1029. George Barry Goodman.
1046. Joseph Shepherd.

May 7th.

1088. George Edward Dering.
1135. Louis Sautter.

May 9th.

1043. William Williams.
1044. John Anthony and William Treeby Chafe.
1084. John Chedgey.

WEEKLY LIST OF DESIGNS FOR ARTICLES OF UTILITY REGISTERED.

No. in the Register.	Date of Registration.	Title.	Proprietors' Name.	Address.
3976	May 7.	Ships' Scuttles	Herman Harbush Armstrong	184, St. George's-st., Wellclose-sq.
3977	,, 8.	The Sans égal Portmanteau	Philip Phillips	30, St. Martin's-lane.
3978	,, ,,	Octagon Laundry Stove	Robert Macnab	Perth.
3979	,, ,,	Lock	John Bush	Derby.
3980	,, 12.	Candle Holder	Price's Patent Candle Company	Belmont, Vauxhall.
3981	,, ,,	A Drain Pipe	J. and W. Baker	St. Philip's, Bristol.
3982	,, ,,	Improved Fastener for Umbrellas	Fountain John Hartley	21, Pump-row, Old-street-road.

Journal of the Society of Arts.

FRIDAY, MAY 22, 1857.

NOTICE TO MEMBERS AND INSTITUTIONS.

The prizes awarded by the Society's Examiners to the successful Candidates at the June Examination in London will be distributed on the morning of Tuesday, the 23rd of June, at the Society's House in the Adelphi.

The Society's Annual Dinner will take place at the Crystal Palace in the afternoon of the same day. Lord Stanley, M.P., will preside.

The Sixth Annual Conference of the Representatives from Institutions in Union with the Society, is appointed to be held at the Society's House on Wednesday the 24th of June.

The Annual General Meeting for receiving the report of the Council and the Treasurer's statement of receipts, payments, and expenditure during the past year, and also for the Election of Officers, will, in accordance with the Bye-Laws, take place at 4 o'clock on the same day.

EXHIBITION OF INVENTIONS.

The Exhibition of Inventions will close on Saturday next, the 23rd inst. Exhibitors are requested to give directions for the removal of their articles by Wednesday, the 27th inst., at the *latest*.

THE SEDDON PICTURES.

The Exhibition of these Pictures will close on Wednesday exening next, the 27th inst.

ART-TREASURES EXHIBITION.

The period fixed for the Society's visit to the Manchester Art-Treasures Exhibition, is the week commencing the 30th of July.

A Local Committee has been formed in Manchester to make arrangements for the Society's reception there.

That Committee is desirous of knowing, as early as possible, the number of members likely to visit Manchester, in order that information respecting hotels and lodgings may be obtained.

The Committee are making application to the principal Societies, the Exchange, and various large manufacturers, for the admission of members of the Society of Arts, during their visit, on showing their cards of membership.

TWENTY-SECOND ORDINARY MEETING.

Wednesday, May 20, 1857.

The Twenty-second Ordinary Meeting of the One Hundred and Third Session was held on Wednesday, the 20th inst., William Brown, Esq., M.P., in the chair.

The following Candidates were balloted for and duly elected members of the Society:—

Beale, Miles
Cameron, H. O.
Christie, Robert Monro
Maurice, James

The paper read was:—

ON THE BRUSSELS CONGRESS OF 1856, AND ITS BEARING ON THE PROGRESS OF INTERNATIONAL COMMERCE.

By Thomas Winkworth.

There is probably no science less inviting to the general student than that of political economy. There are doubtless some general principles connected with it not difficult to understand, but in the attempt to apply them practically, many an ardent professor has given up the study in despair. Not only is it necessary to be somewhat familiar with the driest of all illustrations, statistics, but to disentangle them from those exceptional conditions, continually arising, which affect their apparent relations to each other, and to evolve from them evidence of the soundness of the theories they are intended to establish. The commercial intercourse of different countries, for instance, is variously affected by the greater or less degree of intelligence which obtains, by the differing forms of government, by national temperament, by the effect of variety of climate on animal and vegetable production, and by the occasional derangement of pecuniary position which excess of speculation or other disturbing elements may superinduce.

It is difficult to believe, but it is not the less true, that even war, pestilence, and famine, have their influence on this science, and require that their mission, however painful in the experience, should be correctly understood. Though evil in themselves, being simply destructive agencies, they are often followed by the most salutary results; they all excite sympathy, while famine, in particular, opens up new channels of commercial intercourse—for food must be obtained at whatever cost. It appears to be in the order of inscrutable wisdom, in relation to the present condition of man, that scarcely any permanent good can be secured without passing through the ordeal of violence and suffering. We may suppress discontent by arbitrary power, encourage ignorance by rewarding bigotry, and even, for a time, clothe error in the guise of truth—but, at length the smouldering elements of suffering will burst into flame, and the ensuing destruction may, for the time, involve the good and the bad, the guilty and the innocent, in one common ruin—until at length, as in the physical, so in the moral world, ignorance gives place to knowledge, bondage to freedom, and chaos to order.

The late famine in Ireland, for instance, called forth British charity to an extent that cannot soon be forgotten, and prepared the way for that large emigration of the Irish people, which relieved one country from an unemployed population, while it enriched another with a body of useful colonists—it broke up an unhealthy political organisation, from which no good could be derived, and sent its members to assist in founding new empires on the opposite shores of the globe. But, besides all this, it led to the abolition of our corn laws, and the many other fiscal ameliorations which constitute the principal topics of this paper. Notwithstanding all difficulties, however, real or supposed, there are certain leading principles which command the assent of even superficial enquirers; and few are now found to doubt the propriety of promoting the general freedom of trade, so far as it can be carried into effect without an undue pressure upon the vested interests of society. That this opinion is increasingly prevalent, appears from many circumstances, to one of which I shall hereafter more particularly allude. Others will suggest themselves as we proceed.

We live in practical times, and many who would formerly have turned away from the study of political economy in disgust, are now its most earnest advocates. The scope afforded for choice by its many branches, not all necessarily connected with each other, and the growing perception of its importance to the discovery of many hidden springs of national wealth, which now so extensively prevails, are sources of encouragement to the philanthropist and statesman, and invite to further investigation.

I propose, first, to give some account of the origin and objects of the Brussels Congress; and, then, to trace the progress and prospects of liberal commercial relations between different countries, so far as the materials I have endeavoured to gather, may afford me the means.

The particular branch of this science for the discussion of which the recent Congress at Brussels was intended to afford facilities, is that which is popularly known as Free Trade. So far back as 1846, an economic movement was there inaugurated by Mons. de Brouckère, the Burgomaster, a noble-minded, independent, and energetic man, which, though somewhat interrupted by the revolutionary events of 1848, nevertheless took root in the commercial and manufacturing mind, and burst into more complete devolopment in December 1855, under the enlightened and vigorous presidency of our corresponding member, Mons. Corr vander Maeren, *ancien juge de commerce* of that city. The original "Société Belge d'Economie Politique" is now merged into, or become co-relative with one taking the name of, "L'Association pour la Réforme Douanière." The combined action of these two bodies was directed to the introduction of more liberal tariffs than had hitherto prevailed in that country, but with varying success. In the course of their discussions, they found that even in Belgium, which, next to our own country, enjoys, perhaps, the greatest amount of constitutional freedom, the most profound and, in some cases, wilful ignorance prevailed on that subject. At length the idea occurred to the executive, that if there was all the truth in their theory which they claimed for it, the time was arrived when it might be submitted to the ordeal of examination by an international Congress. Accordingly a provisional committee was appointed to arrange for its organization, a time fixed for its assembling, and measures adopted to give to the proposed meeting the most extensive publicity in Europe and America, so as to ensure an influential gathering of persons best able, from their experience in the countries they represented, to impart knowledge on the subjects to be discussed. The proposed "Congrès International des Réformes Douanières," was advertised to meet in September last, immediately after one called "Le Congrès de Bienfaisance," at which a large attendance of enlightened philanthropists was expected. At both of these assemblies the Council of the Society of Arts, Manufactures, and Commerce, decided to be represented by deputation, and were pleased to appoint their Chairman, Col. Sykes, Mr. Thos. Twining, and myself. Unfortunately, the onerous duties of the former, as Chairman of the East India Company, prevented him from going over, and it was therefore left to Mr. Twining and myself to discharge the duties of the appointment. As might naturally be expected, Mr. Twining, to whose persevering and judicious advocacy of economic appliances, both moral and mechanical, the working classes are so largely indebted for comforts and even luxuries, represented us at the "Congrès de Bienfaisance," and I undertook to assist at the other.

Political economy being still, in the estimation of many persons, a "much-vexed" science, and the application of its principles being variously understood, even in this country, with all our experience, I did not feel myself at liberty to commit the Society to any formula on which there might be a difference of opinion. Accordingly, while availing myself of all the *prestige* with which I was invested by my connexion with the Society, as its representative, I carefully acted on my implied instructions, as may be seen in the printed Report of the proceedings of the Congress. We were, however, practically, though not officially, represented by other members, particularly by Messrs. W. Ewart, M.P., B. Oliveira, M.P., Jas. Yates, Edwin Chadwick, Stephen Lewis, Alfred Tylor, Henry G. Bohn, E. B. Neill, W. G. Lumley, and others, so that I was not left to fight the battle of knowledge *versus* ignorance alone, some of these gentlemen having also taken part in the deliberations.

But, besides members of our Society, many other important bodies from this country were there represented, as, for instance, the Chambers of Commerce of Manchester, Birmingham, Newcastle, Bradford, Burslem (Potteries), Leeds, Belfast, Kendal, Edinburgh, and Liverpool; the Association for the Reduction of Duties on Wine; those also for Promoting Uniformity of the System of Weights and Measures; for the Establishment of Tribunals of Commerce; and for Financial Reform, at Liverpool, many of the delegates from which spoke at our meetings. Letters also from other influential friends to international commercial freedom, unable to attend personally, were read, particularly from the late Lord Mayor, Alderman Salomons; Mr. Cobden, M.P.; Col. Sykes, now M.P.; and Mr. Twining.

For many obvious reasons, Great Britain was more largely represented than any other country; but Germany, France, Spain, Holland, Switzerland, and America responded by delegation to the invitation of the committee of organisation.

It may prove interesting if I here describe in a few words the order of proceeding. We were informed that as it might be inconvenient to some representatives to speak in a foreign language, they would be at liberty to use their own. It so happened, however, that of this indulgence no one speaker availed himself, and all the addresses were delivered in French. I call them "addresses," because the greater part of them were written, and assumed rather the form of essays than speeches. Occasionally, indeed, a gentleman would speak without notes, and a great relief from the more formal character of the discussion it generally proved to be. Indeed, the very word "discussion" is a misnomer, as those desiring to speak were required to inscribe their names previously, and were called to the tribune or pulpit in the precise order of insertion without the slightest reference to the particular topics previous speakers might have opened up. Discussion, therefore, as we understand it, there was but little, for whenever any member made an attempt to answer off hand the arguments of the last speaker, he was peremptorily silenced by the president, unless by accident his name was the next on the agenda. Notwithstanding, however, this peculiarity, which is essentially continental, the practical result was by no means unsatisfactory. Speakers generally addressed themselves to such arguments and illustrations as their own experience and specialities supplied, and having no one to answer, they were able to condense much valuable matter into a comparatively small space. This was especially the case on the first of the three days, but on the second some gentlemen occasionally took up the arguments of speakers of the preceding day, and on the third, others replied to the objections of these last. To this limited extent, therefore, there was some semblance of discussion.

My own case will perhaps supply a slight illustration of the working of the system. At the suggestion of Mons. Corr vander Maeren, I sent him a copy from England of what I proposed to say, which he undertook to get translated for me into French. On my arrival, however, at Brussels, it was not ready, nor did I get it until the evening before the opening of the Congress, when at his desire I had allowed my name to be inscribed as an early speaker, what I had to say being in his opinion more directly to the point than anything his own countrymen or those from France were likely to bring forward. He considered, therefore, that if it did nothing more, it might in this particular afford a hint to succeeding speakers. Under these circumstances, judge of my dismay when, on looking over the manuscript translation of my speech, I found it to be almost illegible, and so abounding in blots, erasures, interpolations, and incomprehensible hieroglyphics, that for me to attempt to read it with any effect was quite out of the question. This discovery was the more mortifying as being necessarily rather a lengthy document—I had not time to make a fair copy of it. After some consultation it was decided that I should ascend the rostrum in my turn, open my subject with a few introductory sentences in French, and then request that a friend, Mons. Jottrand jun., might be permitted to read my speech for me in extenso. This was immediately granted, and that gentleman being an excellent English scholar, placed the orginal MS. and the translation before him, and contrived to secure the attention of the sitting until he had concluded the reading. As in my speech or essay, into which he infused an animation to which I could have made no pretention, I proposed to illustrate the working of the free trade policy in this country since its general, though still incomplete, adoption in 1846, by abundant evidence kindly placed at my disposal by Lord Stanley of Alderley, president of the Board of Trade, and by an epitome which the history of the silk trade affords, of the effects on that manufacture of the three conditions to which it has been subjected since its introduction about the 14th century, viz., prohibition, heavy duties and comparative freedom from them, my task was an easy one. The speeches of the gentlemen who preceded me were confined to matters purely fiscal and local, as between Holland and Belgium, so that I was the first who broke ground on the general question. In fact our total abolition of all prohibitions, the abrogation of the greater part of import duties, and the nearly nominal character of what are still retained, those on tea, wines, and tobacco, being nearly the only exceptions, and all this without any conditions or treaties of reciprocity, on the faith only of the principle being fundamentally sound, at once disposed of the assertion so frequently repeated by continental protectionists, of "Vendus Aux Anglais." We had, indeed, no object to serve beyond that which is equally advantageous to all countries without being injurious to any, viz., the free exchange of those commodities which are most easily produced in one country for those which may be indigenous to another. The revelations, therefore, which I was able to make of the advantageous results already secured from this policy, particularly as exhibited in our returns of exports and imports since its adoption, from a remarkably clear statement of them drawn up by Mr. Edgar Bowring, of the Board of Trade, seemed to strike the greater part of my hearers with an agreeable surprise. I did not, however, entirely escape criticism, for a speaker on one of the following days controverted some of my facts, but so gently, and to such an unimportant extent, that it was not deemed desirable that I should make any reply, even if the courtesy of the president (the Burgomaster of Brussels) had permitted me to attempt it.

This, then, will serve to give the Society some idea of the order of proceeding at continental congresses, which has the advantage, on the one hand, of securing the probabilities of matured argument, and the disadvantage, on the other, of no ready means being afforded of at once correcting erroneous statistics or exposing crude theories. It must, however, be admitted that the system effectually prevents those interminable discussions of which our parliamentary proceedings afford such ample examples—in which, after speeches of some hours' duration have been delivered, distinguished by brilliant oratory and biting sarcasm, the hearers or readers are quite at a loss to detect the point or to evolve the smallest modicum of argument out of the mass of splendid verbiage in which they are couched or concealed. In many such cases, even the subsequent vote fails to supply the key, as it is not unusual for the one to be in direct antagonism to the other.

The following are the particular questions which were submitted to each member of the Congress for discussion; it will at once be perceived that they embrace the whole theory of free trade:—

1st. "What are the artificial or natural obstacles opposed to the extension of the commercial relations of the country to which you belong?

2nd. "What are the practical means proposed, or to be proposed, in each country, to remove or diminish the obstacles which impede the extension of commercial relations with other nations?"

The answers to these questions, whether given from the tribune, or supplied by documentary evidence from absent members, or from public bodies unable to attend by deputation, were as full and voluminous as they were valuable. The *procès verbal* of each day's proceedings has already appeared in an authorised volume, and two others, containing selections from the statistical matter just mentioned, are in progress of publication. As these are, or will be accessible to all who take an interest in the subject, I need not attempt a detailed analysis.

I think it right, however, to state, *en passant*, that MM. Stede. Reepmaether, and Ackersdyk, from Holland, M. Hertz from Hamburgh, MM. Cherbulia, Grenns, and Nakonski, from Switzerland, Senor Figuerola from Spain, M. Scialoja from Sardinia, M. le Comte Arrivabēne from Tuscany, MM. Garnier, Wolowski, and Pascal Duprat from France, M. Kurunda from Vienna, M. Ciprie from Naples, Dr. Bamberg from Berlin, and MM. Matthysens, Agie, Molinari, Vanderbruck, Mullerdorf, Cattean, Wattell, Faidar, Auguste Couvreur, and, though last, not least, de Brouckère and Corr vander Maeren, all of them from different parts of Belgium, testified to the progress of the principle in the several countries they represented, and supplied the most overwhelming and conclusive evidence that the theory of free trade is alone that which can provide for those various and important interests which are essential to the discovery and application of talent and wealth, but with the healthy action of which selfishness, ignorance, and prejudice, have too long been permitted to interfere.

It is probable that the greatest continental progress in the direction of free trade may date from the International Exhibitions of 1851 in London, and 1855 in Paris. In both, but particularly in the latter, many articles of usefulness and luxury, the produce of the skill and industry of other countries, were for the first time seen, of which native spectators had been previously permitted only a kind of traditionary knowledge. The more intimately many foreign and local visitors became acquainted with the varied contents of these temporary emporiums of manufactured property, the more they were led to inquire to what repressive policy they were to attribute the ignorance in which they had been so long kept of the productive industry and artistic talent of surrounding nations, and whether the time had not arrived when the barriers might be removed and the ports freely opened to the products of the world. These results had been foreseen by the pioneers of these exhibitions, and constituted a powerful inducement to make them as complete as money, influence, and ability could effect. But great economic reforms are not accomplished in a day, and the discovery resulted from the discussions at the Congress that however well informed individuals might be on this subject, governments generally were by no means equally liberal. Hence the facility with which some of them are persuaded by the interested, that imposts for the protection of certain manufactures are necessary in a national point of view, and that the revenue therefrom derived being self-imposed, if on what are assumed to be luxuries, and easy of collection, ought not to be sacrificed to theoretical experiments, a kind of argument which, with the superficial, often passes for wisdom; we may indeed call it the "wisdom of our ancestors" without any figure of speech, for it is truly characteristic of a past age, as the following extract from Froude's History of England (vol. 1, pp. 6 and 7) will rather amusingly prove.

"In the twenty-fourth year of the reign of Henry VIII. in the statute for the encouragement of the linen manufacturers, it is said that 'the King's Highness calling to his most blessed remembrance the great number of idle persons daily increasing throughout this his realm, supposeth that one great cause thereof is by the continued bringing into the same the great number of wares and merchandize made, and brought out, and from the parts beyond the sea into this his realm, ready wrought by manual occupation, among the which wares one kind of merchandize in great quantity, which is linen cloth of divers sorts made in divers countries beyond the sea, is daily conveyed into this realm; which great quantity of linen cloth so brought is consumed and spent within the same; by reason whereof not only the said strange countries where the said linen cloth is made by the policy and industry of making and vending the same, are greatly enriched, and a marvellous great number of their people, men, women, and children are set on work and occupation, and kept from idleness, to the great furtherance and advancement of their commonwealth, but also contrarywise the inhabitants and subjects of this realm, for lack of like policy and industry, are compelled to buy all or most part of the linen cloth consumed in the same, amounting to inestimable sums of money. And also the people of this realm, as well men as women, which should and might be set to work by exercise of like policy and craft of spinning, weaving, and making of cloth, lies now in idleness and etiosity, to the high displeasure of Almighty God, great diminution of the King's people, and extreme ruin, decay, and impoverishment of this realm. Therefore, for the reformation of these things, the King's most royal majesty, intending like a most virtuous prince, to provide remedy in the premises, nothing so much coveting as the increase of the commonwealth of this his realm, with also the virtuous exercise of his most loving subjects and people, and to avoid that most abominable sin of idleness, out of the realm, hath, by the advice and consent of his Lords and Commons in Parliament assembled, ordained and enacted that every person occupying land for tillage, shall for every sixty acres which he hath under the plough sow one quarter of an acre in flax or hemp.' This act I think was designed immediately to keep the wives and children of the poor in work in their own houses, the abominable sin of idleness, being to King Henry, the one hatefullest of offences in all persons of whatsoever sex or age; but it leaves no doubt that manufactures in England had not themselves that tendency to self-development which would encourage an enlarging population. The woollen manufactures similarly appear, from the many statutes upon them, to have been vigorous at a fixed level, but to have shewn no tendency to rise beyond that level. With a fixed demand, production continued uniform."

It appears from this remarkable passage in our history, that there was a time when "ignorance was bliss," but we now know that if any state in this world can be called blissful, it is that which can only be obtained by knowledge.

The disinclination of our forefathers to cultivate hemp, or as they spelt it *Hempe*, gave rise to a curious distich, "when hempe is spun England's done." Lord Bacon notices this popular saying, which afterwards became a prophecy in ages of superstition. This prophecy was supposed to have been fulfilled at the accession of James I., by the decease of all the sovereigns whose names began with these ominous letters, viz., Henry 8, Edward 6, Mary, Philip, (her Spanish husband), and Elizabeth. When they had expired "England was done" of course, because James was a Scotch king. This is another specimen of the "wisdom of our ancestors." It is astonishing to think how often England has been "done," ruined past hope and help; and yet we somehow manage to get on, and to look each other in the face with much apparent satisfaction.

The "right to protection" which foreign monopolists claim is nothing more or less than the right to get rich at the expense of their fellow countrymen, while the "facility for collection of duties" is found to be complicated, inconvenient, and expensive, compared with that required for direct taxation, imperfect as it is still in this country.

It was to examine and expose all these mistakes, to use a mild term, that the Brussels Congress was held, and it was to complete this object that an "International Association for Customs Reform" was then established, under whose auspices a still wider development to the policy of free trade is being given. As one mode of accomplishing this, a well-written newspaper, called *L'Economiste Belge*, communicates all suitable information, and public meetings are also held from time to time even in the strongholds of monopoly, often under threats of personal violence, but hitherto with the most encouraging results. All this, however, involves expense, and it is to assist in meeting this that appeals have been made to the friends of the cause in this country and elsewhere.

I will now address myself to the *second* branch of my subject, in the treatment of which I must claim a little latitude of arrangement, as it is only within the last few days, and after I had finished my paper as well as I could without them, that I obtained some additional materials from abroad; they will be found, however, too important to be omitted, although, perhaps, somewhat irregularly introduced.

And here it will be natural that I should begin with *Belgium*, the country which, as we have seen, took the initiative in this great movement. Much that has occurred there since September last, has become matter of history through the press, but there are some additional particulars with which I have recently been supplied by a member, the president of the "International Association," M. Corr vander Maeren, which will be found interesting and encouraging.

The right to meet for discussion being guaranteed by the constitution, public meetings, for the purpose of free trade agitation, have been held at Antwerp, Mons, Liège, and Verviers. This last was a very important one, as, for the first time, the champions of protection ventured to enter the arena. Hitherto they had been content to fire their small shot—and very small it was—through the medium of the press; a portion of which they had subsidised for that purpose—but on this occasion they came boldly forward, with what success may be easily imagined, when I add that it resulted in a subscription for the promotion of the free trade policy. During the first 24 hours it amounted to about £600, a circumstance wholly unprecedented anywhere on the continent. Verviers is the seat of the woollen manufacture, and from its advanced views on political economy, may be deemed the Manchester of Belgium. An attempt had previously been made to hold a meeting at Tournay, but in consequence of the violent and disgraceful proceedings there, which attracted the notice of the Chamber of Representatives, and is now being investigated by the government, it was for the moment abandoned. As soon as these enquiries are terminated, another attempt will be made to instruct the people of that town in their real rights and duties. In the meantime, the effect of this violence has been decidedly to call attention to the whole question of free trade, in quarters where it had hitherto excited little or no interest, and measures of great amelioration of the tariff are now under legislative discussion. Indeed, some of these have already become law. Differential duties, excepting on a very few articles, are entirely suppressed; upon 30 to 40 articles the existing duties have been entirely removed. Reductions to the following extent have also been effected—

On Machinery, from 40 fr. to 5 fr. the 100 hectolitres, say 2 cwt.
On Pig-iron ,, 5 fr. to 2 fr. the 100 kilogrammes, ,,
On Bar-iron ,, 12·70 to 4 fr. ,, ,, ,,

Besides all this, the Chambers have just adopted the law proposed by the liberal ministers of 1854, comprising the reduction or complete abrogation of duties on all raw materials and articles, 54 in number, necessary to the manufacturer.

A proposition has also been submitted to the chamber of commerce, and will come before the chamber of representatives next session, but which before these discussions had been withdrawn altogether, that will largely affect for good the cotton spinning trade.

But it must not be supposed that all these steps in the right direction have been, or are being effected without opposition. Besides what I have already mentioned, the Protectionist manufacturers of Belgium united, with others from France, to form a society having for its object the maintenance of the *statu quo* of duties. They even had recourse to the unconstitutional step of addressing the King on the subject, instead of laying their complaints before the legislature. They also established a journal called "*L'Union Continentale*," in which they did not hesitate to acknowledge that their object was to agitate against English commerce, by the introduction of the first Emperor's *Blocas Continental*. No doubt they dreamt of the glorious times of the Berlin and Milan decrees, when English goods were actually seized in the warehouses of Antwerp and publicly burned. This much resembled the Irishman's mode of ruining a bank, by buying up its notes and burning them.

It will thus be seen that the economists of Belgium exercised a wise discretion when they decided to call the attention of intelligent men throughout Europe to the advantages which all nations would derive from the universal adoption of the free trade system. Much, as we have seen, was done at the great meeting to which they were invited in furtherance of this object, but much remains to be accomplished. Those who are actively engaged in it will find it necessary, considering the elements with which they have to deal, first to establish the soundness of the principle by shewing that opposition to it is only the war of partial against general interests, and then to prove by the indubitable testimony of facts, that all nations prosper, and that our own in particular has prospered, in the degree in which that principle has been carried out.

The soundness of the general principle commends itself immediately to every unprejudiced mind as soon as its terms are understood. The superior productiveness of freedom as compared with monopoly, scarcely requires to be proved at any length in the present state of science, but it must be constantly set forth and insisted upon so long as any prejudice remains in favour of the restrictive system. If the vine flourish in the south, while iron and coal are produced in the north, the north and the south must needs find their account in dealing with one another. When two nations direct their industry into the most productive channels, and exchange their surplus products with each other, both are obviously benefited, and in an equal degree. If England were to produce a given quantity of wine in her bleak, foggy climate, at a cost of £1,000, which she could buy of France for £500, it is clear that she would lose the difference between the two sums. If France, on the other hand, were to produce cotton goods or cutlery at a cost of £1,000 which she could buy of England for £500, she would, of course, be a loser to the same amount. Yet the absurd rivalry of the two countries has induced them to commit this egregious blunder for many weary centuries. Each has consented to impoverish itself in the idle fear of enriching its neighbour. All that while French doors have gone with bad locks and hinges, and French peasant girls without white stockings, lest the English workman should do too well; and the poor English labourer has given himself the cholic with sour beer, when he might have regaled himself at nearly the same cost, with the rich and glowing vintages of the South of France.

All the doctrines of free-trade, pursued through a thousand complex calculations, are capable of being resolved into propositions as plain and self-evident as those now stated; and yet it seems necessary, and is necessary, to form an extensive association in order to teach these simple truisms to the so-called enlightened nations of Europe.

From Belgium I turn to *France*. No country in Europe would be more benefited by a free system of commercial intercourse than France, and yet in no country is the opposition to its introduction more strong among the manufacturing classes. France ought to have taken the lead in emancipating trade from all its bonds, as some of her most distinguished writers were among the earliest advocates of freedom. Quesnay and the economists set the example which was followed by our own Adam Smith, who was much indebted to the French philosophers. The former, M. Quesnay, in one of his general maxims says:—"Qu'on maintienne l'entière liberté de commerce; car la politique commerciale intérieure la plus sûre, la plus exacte et la plus profitable à la nation et à l'état, consiste dans la pleine liberté de la commerce." (Physiocratie, première partie, p. 119.)

Among many other advocates of freedom in that country may be named the amiable and accomplished Fenelon, Archbishop of Cambray, who, as tutor to the Duke of Burgundy, afterwards Dauphin of France, wrote his interesting tale of "Telemachus" to assist the studies of his youthful pupil. In that volume the doctrines of Free-Trade, as taught by the economists, are strongly inculcated, and the prince was also well instructed on the guilt of ambition, the value of peace, the importance of fidelity to treaties, and the responsibility of kings; the whole of which implied the strongest condemnation of the policy of his grandfather, Louis XIV., the then reigning monarch.

In one of the most beautiful passages in his "Telemachus," Fenelon points out the natural progress of a commercial city in opulence and power, where there are no vexatious restrictions, and arbitrary dues, where strict justice is maintained, and where the ships of all nations are freely invited to unload their stores. The allusion is supposed to be to the early history of Amsterdam. His words are:—

"Besides this, the liberty of commerce was complete. Far from restraining it by imposts, a reward was offered to all merchants who would bring the commerce of any new nation to Salentum. Thus the people came in crowds from all parts; the trade of this city resembled the flux and reflux of the sea. Treasures came in, like waves flowing one over the other. Everything was brought into it and went out freely; everything that came in was useful; everything that went out, left in going other riches in its place. The strictest justice reigned in the port among so many nations. Frankness, honesty, candour, seemed from the height of these lofty towers to call the merchants from the most distant regions; each one of these merchants, whether he came from the eastern shores, where the sun rises each morning from the bosom of the waves, or whether he set forth from that great sea where the sun, wearied in his course, goes to extinguish his fires, lived in peace and security in Salentum as in his own country."* (Telemachus, book 12.)

This is what we mean by Free-Trade.

Fenelon's pupil gave every promise of a life worthy of his master, but death cut short his days while he was yet in the prime of manhood, and the invaluable counsels of the noble-minded Archbishop were buried in his grave. Under the guidance of Mme. de Maintenon and Père Telliers, Louis went on with his senseless wars and reckless extravagance; by repealing the edict of Nantes, he gave England the silk trade, and destroyed the last remains of French liberty, thus laying the foundation of that extreme misgovernment which never ceased until it found a tremendous reaction in the revolution of 1789. There are many grounds for believing that no country would profit more from freedom of commerce than France, and I feel equally certain that no country has suffered more from its absence. Had the counsels of Fenelon been followed, the horrors of the first revolution might never have occurred.

Among the beneficial results of the late Congress, we may safely calculate on the prevalence of sounder and more liberal views on this subject in the minds of thoughtful men throughout Europe. During, and subsequent to, these discussions, many important facts have been elicited of a most encouraging nature, and which shew that the light of this important branch of knowledge is finding its way in all directions. The following passage from a recent speech of the French Emperor fully justifies to a large extent this expectation. He says, "they," the protectionists and the prohibitionists, "even succeeded recently in alarming public industry, as if the government could desire anything else than its development and prosperity. It is, therefore, the duty of good citizens to spread everywhere the wise doctrines of political economy." It would seem from this language this his majesty is fully impressed with the value and importance of commercial freedom, although local circumstances and class interests may for a time throw impediments in the way of its practical recognition.

I do not know how far a remarkable passage or two in the *Revue des deux Mondes*, of December last, may owe their paternity to the "International Association," but they deserve more than a passing notice, and constitute the circumstance to which, at the opening of my paper, I said I would more particularly allude. The article was written by the justly celebrated economist, Michel Chevalier, in reply to a report by Mons. Mimerel against customs reform, presented to the *Conseil Général du Département du Nord*. It would seem to be almost an insult to an enlightened nation like France to imagine it necessary to urge elementary arguments in support of a liberal commercial policy, or to suppose it possible that a man of intellect like M. Mimerel, could really believe in the antiquated fallacies he was defending, but the melancholy fact that there were those who could honestly adopt them, rendered the following illustrations of first principles from this accomplished reviewer absolutely indispensable. In exposure of the assumption that the abolition of the prohibitive system in France would be followed by an inundation of foreign manufactures, and the ultimate closing of the factories, mills, and workshops of that country, M. Chevalier says:—"Since M. Mimerel commenced his campaign in the cause of prohibition, which he proclaims to be the palladium of French industry, it has disappeared in many states,—first of all in England, in Holland, and in Piedmont; it has been abolished in Austria, and Spain and Russia retain only vestiges of it. Prussia has never known it—at least not since 1814. Are the manufactories of those countries shut up on that account? Certainly not; they are more active every day. France, then, stands as an exception in prohibition; 19-20ths of her manufactured articles are prohibited in our tariff, but there are here and there some articles which are not prohibited—such as silken tissues, spun thread, and certain varieties of thread and wool. Now, I ask, is the production of these articles at an end with us? Is it not, on the contrary, considerable, and every day increasing? Even in France, since 1836, some prohibitions have been removed, and have the manufactures which have lost that protection disappeared? Are they not now more flourishing than ever? A little more than a year ago a decree temporarily removed the prohibition which affected vessels built in foreign countries, and those vessels are considered as French on the payment of a moderate duty. Has shipbuilding in France suffered an injury therefrom? It cannot, then, be alleged that prohibition is the indispensable condition of the existence of our dockyards. If this were the case, while other countries so easily do without that protection, we should be at the very lowest step of the ladder.

"It is a mistake to suppose that foreign competition would necessarily lower the price of manufactured articles, so as to endanger their production and reduce wages. A great number of manufactured articles are produced by us as cheaply as they are abroad; these are the articles which we export. They already represent a sum of 1,100,000,000f. If M. Mimerel consults the *Tableau du Commerce* for 1855, he will see at page XIII. that the amount of our exportation in manufactured articles has been 1,080,000,000f. From that he will have to deduct what is sent to our colonies, which are reserved markets; but he will see at page IX. of the same *Tableau* that the colonies, including Algeria, only stand in our foreign trade for 8 per cent., which leaves 1,000,000,000f. to our trade under competition. If we then examine how these 1,000,000,000f. are made up, we shall see that nearly all the great categories of our merchandise figure in them. We find our woollen, cotton, thread, and hemp manufactures, our silks, &c., our paper in all its appliances, our metals, our dressed hides, goldsmiths' work, jewellery, *modes*, clocks, and watches, cutlery, the manifold articles of Parisian manufacture, perfumery and soaps, arms, plating, cotton and woollen threads, refined sugars, pottery, glass and crystal—in a word, the whole of our industrial encyclopædia, and the greater part stand on the list for large sums. I do not now speak of natural products, of agricultural ones properly so called, such as wines and spirituous liquors, corn, raw wool, madder, raw silk, common wood, eggs, butter, fruits, oil seeds and fruits, cattle, and other similar produce, which form another mass of exportation to the amount of 478,000,000f. The forcible conclusion is, that, in strictness, nearly the whole of the manufacturing industry of France, without speaking of agricultural industry, could well do without not only prohibition, but even any protective duty whatever, for when people export merchandise they, of course, excite foreign competition on its own ground, and this is a proof that we do not fear it. The *Tableau du Commerce* shows that such of our products as are protected by prohibition are compromised in our exportations for a sum of about 400,000,000f."

M. Chevalier is equally happy and cogent in his refutation of the usual commonplaces about the assumed necessary consequence of competition and improved machinery, permanently to reduce the price of labour, by reference to their effects in England, where, notwithstanding the comparatively low price of goods, labour is high, while in Naples, where labour is miserably low, manufactures are notoriously very dear.

But the argument, or, rather, the assertion that the object of English free traders is to ruin their foreign competitors, and which is so constantly reiterated, *ad nauseam*, in France, Belgium, and other protectionist countries, is that on which, failing all others, and in the face of indisputable evidence to the contrary, the indefatigable advocates of prohibition and protection most confidently rely. To this, therefore, M. Chevalier deems it advisable to address himself with a manifest regret that anything so trite and obvious should still be necessary. He says, and it is the last quotation I shall make from him:—"No doubt, when England introduced this great change in her commercial legislation, she sought to satisfy her own interests, and the event proved that, in so doing, she was well advised, but it cannot be denied that the measures she adopted were likewise eminently favourable to French interests, and that there was no reason to condemn her policy. If ever a government deserved the applause of mankind it was that of England under those circumstances. What would the prohibitionists have said if the parts were reversed, and if it were the French government which had, without demanding any reciprocity, opened the entire extent of her territory to British produce free of duty, or subject only to 10 per cent.? What would they have said if this change in our tariff was limited only to articles in which it is notorious we excel, such as millinery, bronzes, stained paper of superior quality, articles of Paris, silks, and merinoes? They would have poured forth a flood of metaphors. M. Mimerel would have repeated, with increased solemnity, what he said 20 years ago, when spun cotton, numbered 143 and upwards, was allowed to enter, and three years since, when Belgian cottons were allowed to enter on paying a duty of 30 per cent., viz., that the manufacture of all these articles was ruined in France. He would say so, I may be permitted to add, with as little reason, for everybody knows what has become of all those sinister predictions. The manufacture of cotton thread numbered 143 and upwards has increased tenfold in France, since its importation has been authorized; and as to Belgian cottons, with which we were to be inundated, the most insignificant quantity, less than five quintals, in fact, was imported in 1855."

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* Most English boys read "Télémaque" as a class-book at school, and it is a fit introduction to the doctrines of Adam Smith. The free-traders of our time little think how much they may have been indebted for their ultimate success to the beautiful romance of the Archbishop of Cambray.

So far M. Chevalier. But there are other French economists who might be quoted with equal advantage to the cause we advocate, particularly M. Say, who successfully combats the theory that it is possible to produce in excess, by shewing that as all trade when resolved into its ultimate principle is barter, the apparent excess in one country arises from an inadequate production of suitable articles for exchange in another;[*] and M. Jules Lebeau, of the Boulogne Chamber of Commerce, who, in December last, at the request of the Minister of Commerce, drew up a most valuable report on the British tariff, and its general influence on French interests, in which, while he expressess his regret that our code still retains some exceptional imposts, he also urges that it is rather in the French than the English tariff that further relaxation is required to complete that great extension between the commercial relations of the two countries which is so much to be desired.

The recent *escapade* of the Baron Dupin at a meeting of the "Academy of Moral and Political Sciences," would seem to imply that, after all, France is not so far advanced in this knowledge as these quotations would have led us to expect. On that occasion, as we are told by the *Times'* Paris correspondent, dated April 28th, M. Dupin was pleased to speak in rather strong terms about England in connexion with the doctrines of free trade, and from the remarks he let drop it could plainly be seen that we are all looked on by that gentleman as little better than commercial hypocrites. M. Dupin did not exactly use the French word which comes nearest to "humbug," but the sense was much the same. He startled his learned colleagues by declaring it was a mistake to suppose that England was a country where free trade was practised. While England, he said, was "trumpeting" forth her *libre échange*, she was obtaining not less than 500,000,000f. from her Customs, and he instanced the manner in which the silk manufactures of France are received in England. England, in a word, was constantly boasting of her liberality in commercial matters, while she was, in fact, anything but what she proclaimed herself to be.

M. Michel Chevalier, who is also a member of the Academy, stood up and said he could not help expressing his astonishment that so judicious a person as their learned colleague, M. Dupin, should have thought it becoming to make himself the echo of the systematic defamation of England, which certain persons indulged in who were remarkable, some for their inaptitude as manufacturers, others for their arrogance; and who constituted, among the industrial classes in France, a minority small in number, but employed in incessant agitation. Those persons were in the constant practice of talking of the intrigues of England, but it was only for the purpose of masking their own intrigues, the object of which was the levying a perpetual tribute on their fellow-citizens by means of prohibition—a tribute to which they had no right whatever. He again expressed his surprise that such were the terms in which a great and neighbouring nation was spoken of in the Academy of Sciences, and he regretted sincerely that such should be the case. England did not trumpet forth her doctrines of free trade. She had done more than that, she had practised what she preached; she had carried out the principles she proclaimed, and, while other nations shared in the benefits of her policy, she did not make reciprocity a condition of that participation.

The *Times* of May 2nd makes some very sensible remarks on this incident, which, being too long for the text of this paper, and too valuable to be altogether omitted, will be found in a note.[*]

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[*] "As each of us can only purchase the productions of others with his own productions; as the value we can buy is equal to the value we can produce, the more men can produce the more they will purchase. If certain goods remain unsold, it is because other goods are not produced, and it is production alone which opens up markets to produce. I have observed that whenever there is a glut—a superabundance—of several sorts of merchandise, it is because other articles are not produced in sufficient quantities to be exchanged for the former; and if those who produce the latter could provide more of them, or of other goods, the former would then find the vent which they required; in short, that the superabundance of goods of one description arises from the deficiency of goods of another description."

[*] "M. Dupin has been assuring the Academy of Moral and Political Science at Paris that it is a great mistake to suppose England a free trading country. She is, indeed, a most accomplished hypocrite. While she has been "trumpeting" forth her "*libre echange*," she has been obtaining more than twenty millions sterling a-year from her Customs, and has shown a particular spite to the silk manufactures and other productions of France. On this occasion the character of England was warmly and ably defended by M. Michel Chevalier, a man as well known as M. Dupin, and with opinions less dependent on circumstances, interests, sensations, and years. It is no purpose of ours to show what is too well known in France,—that M. Dupin is perpetually neutralizing his own statements, or, as we say, eating his own words. But it may be worth while, on this particular point just to present the facts of the case before such of our neighbours as care to have them. For this purpose we will take the most recent return of our revenue, that for the year ending last March 31; and if M. Dupin wishes for any other year we are ready to follow him. In that year it is very true, and we sufficiently lament the fact, England did raise by Customs—that is, by taxing the produce of other countries—no less a sum than £23,321,843. But, then, she raised from other sources more than twice as much—that is, £49,012,219. In no commercial country is the proportion of revenue raised by Customs so small compared with the whole. But what is most noticeable about our Customs' Tariff is, that it is all for revenue, none for protection. It can only be for revenue that we raise so large a proportion of the sum paraded by M. Dupin from sugar, tea, coffee, tobacco, and other exclusive foreign productions. In this country we do not attempt to produce our own sugar and tobacco. On spirits we carefully adjust the Excise and the Customs, so that the latter shall not operate as a protection. We carry this principle of adjustment through almost every

Notwithstanding this ridiculous "passage at arms," let us hope that it may not be really premature to congratulate our neighbours that though the fruit may not yet be ripe, the culture is better understood, and the result merely a question of time, the early advent of which, the advice contained in the speech of the Emperor, and the contributions of M. M. Say, Chevalier, Lebeau, and Bastiat, encourage us to expect.

In consequence of the war, hardly then terminated, *Russia* was not represented at the Congress, but recent information leads us to expect that the impulse then given to sound principles and political economy, has told in a remarkable manner on the government of that country. We are assured, on good authority, that a tariff of duties scarcely less liberal than our own is on the eve of publication, the principle on which it is to be based being a great reduction of duty on raw materials, and on articles of large consumption, as manufactures of wool and cotton, on all of which an abatement of from 25 to 50 per cent. is expected to be made, so that the smugglers' trade may be spoiled. Should this expectation be realised *Prussia* and *Austria*, who have taken the initiative on the Continent in this move, but are yet far from adopting the principle in all its integrity, must, in self-defence, carry out their convictions to the fullest practical extent. Already they have felt the incubus of the Zollverein to be so oppressive, or rather depressive on commercial enterprise, that if they cannot be released from their engagements as parties to the treaty before its termination by efflux of time, it will certainly not be renewed. We have, however, encouragement to expect that even the smaller States who were parties to it, and for whose protection in the interest of prohibition or heavy duties, it was more ostensibly contracted, the real object under that pretence being, however, the watching the frontier for other than commercial security, principally at the instance of Prussia, will soon apply for its repeal.

There is probably no country which has gone through so many political vicissitudes during the last forty years as *Spain*, and yet there are few which exhibit, in so remarkable a degree, the inevitable and gratifying results of even a faint approximation to free trade. Prior to 1841 there was not even free commercial intercourse between one province and another, particularly as regarded Navarre and the Basque districts. In that year existing restrictions were abolished, but it was not until 1849 that such a modification of the tariff was effected as allowed goods to be imported at a lower duty, but still a very heavy one, than had hitherto been imposed. Observe the result:—in 1841 the produce of the Customs was only 18,000,000 fr., but after the imperfect change of system of that year, it gradually rose to 28,700,000 fr. in 1848. Immediately, however, after the large reduction of duties of 1849 it rose to 33,000,000 fr., and in 1855 to nearly 45,000,000 fr. To understand the full importance of this great augmentation of revenue from duties, the fact is on record that during the prosperous days of Spain, when it enjoyed the enormous pecuniary advantages of large transatlantic possessions, with their prolific mines of silver and gold, the revenue from this source never exceeded 47,900,000 fr. (and that was as far back as 1792), we may form some idea of the comparatively rapid strides it has recently made in the right direction. But there are other sources of encouragement connected with that country as regards political economy. It was represented at the Congress, by a most intelligent gentleman, M. Figuerola, formerly a deputy to the Cortes, Professor at the University at Madrid, and specially sent by the Minister *del Formento* (of Progress) M. Colmeiro, and the then Minister of Finance, M. Rodriguez. I am able to add, from private sources of in-

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article of general consumption that happens to be produced both at home and abroad—hops and on paper for example. So thoroughly is the principle recognised, that if M. Dupin can suggest to the working population of England any one article on which they are taxed not for the necessities of the State, but for the convenience of our manufactures, or any other class, they have only to lay their case before Parliament, and, on proof, it will be immediately set right

"M. Dupin, however, has in his eye certain articles which in this country are luxuries, which are either not to the taste of the general population or are confessedly superfluous. That brings us at once to one of the leading principles of our taxation, one which every enlightened and philanthropic financier ought to respect even when he cannot adopt it. We lay the burden of our taxation on wealth, on luxury, on indulgence, on finery, on fastidious tastes. In a quiet and unostentatious way our finance is democratic and disciplinarian. It does the duty of the Roman Censors, the laws of Lycurgus, the sumptuary laws of the mediæval Commonwealths, the asceticism of the Church, of sermons, of rules, of all those direct attempts at the reformation of manners that are admired in books and defeated in practice. We tax silk manufactures and other foreign articles of dress on the same principle that we tax tobacco. The English labourer or artisan, or his wife, can do perfectly well without a foreign hat, bonnet, gloves, shoes, lace, ribands, or other articles of dress. These things are made quite as durable, for the money in this country. It is true that for the same money something more in fashion can be obtained from abroad, but that is a difference for which it is quite reasonable that the British purchaser should pay a trifle to the revenue, as he does also for his tobacco. Even a family in genteel life—a clergyman's family, for example—can live in health, strength, and retirement without contributing from one year's end to another ever so indirectly one farthing to that part of our revenue stigmatized by M. Dupin with a Protectionist character. If it wants silks at all, it need not go beyond the range of our home manufactures. After silks, velvets, and articles of dress, wine is the sorest point of our Tariff in the eyes of a Frenchman. As it is a point which we desire to leave open for inquiry, we shall purposely guard our language upon it; but, as a fact, wine is a luxury in this country, and, as it happens, particularly French wine. There is no wine made in France, that an English labourer would thank his master for; he would think it "something that had been spoilt." Use itself, at least frequent opportunity, produces no change; for it is quite a joke in English households, that whereas a decanter of port left in the care of servants is seen no more, the finest quality of claret suffers no such disappearance. The servants wonder why their masters drink such stuff. There may possibly be a change some day, and even the *vin ordinaire* may be dressed up for the vulgar English taste; but, as a matter of fact, French wine is now the luxury of the better classes, and is taxed accordingly; not for protection.

"We are not informed to what extent M. Dupin admitted the importation of European silk manufactures into this country. It is, however, considerable. We must take into account that it chiefly consists of the more costly fabrics, on which most labour is employed and most taste displayed. During the three months ending last March 31 we imported 3,089.660lb. of raw silk. This was about three times as much as we imported in the corresponding quarter of the previous year, and twice as much as in the corresponding quarter of the year before that The average of the three years would give about 2.000,000 lb. of raw silk for the first quarter of the year; yet in the first three months of this year we imported from Europe 81,583 lb. of silk or satin "broad stuffs," and 131,255 lb. of ribands, besides other items of silk manufacture; and these figures are very little above the average. However, we need not insist on any particular articles, or even on the tariff in force in this particular year. The question is one of evident tendency, of serious intention, and of actual effort. For the last four years we have not been in a condition to mitigate our tariff or any part of our taxation; for it would have been ridiculous to come forward with a proposal to reduce the duty on millinery, silks, and velvets, at the very time that we were levying 1s. 4d. a pound on incomes, and extending the range of that unpopular impost. All other financial considerations must bow to the stern necessities of war, and the present is therefore a very ungracious time to select for invidious criticism on our finance. We hope very shortly to resume the great movement in which England had the honour to take the lead. M Dupin's remarks, however, deny the movement altogether. He says England has trumpeted a falsehood, and is not an honest Free-trader He denies that we have done what we could, or even anything worth speaking of. The exaggeration of this statement shows its *animus*, and, as our own case is clear to the whole world, we are only sorry for M. Dupin."

formation, that M. Barzanallana the present Minister of Finance, is a cordial friend to the theory of Free Trade, and that if he cannot immediately carry out his views, from circumstances with which I am also acquainted, there is every reason to hope that the time is not far distant when a country which, for centuries, was almost hermetically sealed to foreign products, will be freely thrown open for exchange to the manufacturers of the world.

Towards this "consummation so devoutly to be wished," the congressional revelations of September last have contributed their *quota* without stint.

In Italy generally, but particularly in the Papal States, great changes for the better, are being made. "The pontifical government," says a letter from Rome dated April the 25th, of this year, "encouraged by the result obtained from the lowering of the customs tariffs, has just enlarged and completed that reform by introducing fresh changes in the duties levied on a great number of articles of commerce. The duties upon silks, linen, and cotton goods, have been reduced one half;" other details to the same effect are furnished by the writer, who concludes by saying, that "so large a reduction is an evidence of the advantages secured to the papal treasury by its first experiments in this direction."

The *Dutch* government has recently inaugurated a bill, having for its object the reduction of all important duties to a maximum of 5 per cent. *ad valorem.* In *Switzerland* little remains to be done. Progress is also being made in this direction, in *Sardinia*, *Portugal*, *Denmark*, *Sweden* and *Norway.* In the *United States*, some considerable reductions of the tariff of import duties will come into operation on the 1st of July next. In sections A and B, articles which since 1846 have paid a duty varying from 40 to 100 per cent. *ad valorem*, will be reduced to an uniform rate of 30 per cent.; those in section C, of 30 per cent. to 24 per cent.; those in section D, of 25 per cent. to 19 per cent.; those in section E, of 20 per cent. to 15 per cent.; those in section F, of 15 per cent. to 12 per cent.; those in section G, of 10 per cent. to 8 per cent. those in section H, of 5 per cent. to 4 per cent; while the list of articles comprised in section I of 1846, and which pay no duty, will be largely augmented. All articles paying a duty of 20 per cent. not enumerated in the tariff of 1846, will be reduced to 15 per cent. There is thus a reduction of about $\frac{1}{3}$ of duty on articles producing a revenue of about £12,000,000 sterling. The probabilities are that so far from the revenue suffering from this amelioration of the tariff, it will be largely increased, as has almost invariably been the case after each such reduction in this country. Under any circumstances, it is a move in the right direction, and augurs well for the principles of future legislation on this branch of economy.

Turkey has always practised a more liberal commercial policy than might have been expected; perhaps, because the old "mercantile theory," which has been so injurious in Western Europe, never found its way there. If the provisions of the treaty of Paris are fully acted upon, under the influence of France and England, we may expect a rapid development of the valuable resources of the east, both in agriculture and commerce. Constantinople ought to be a most important commercial metropolis, and already is becoming so, by the introduction of such improvements as gas and other modern discoveries, and by the establishment of banks on the best models of London, Amsterdam and Paris.

In the more distant east, British government in *Hindostan* is a guarantee for the freedom of trade, as the rule, over that vast region. *Siam* and *Japan* will soon enter into the commercial commonwealth; *China*, after a little gentle coercion, will probably see the necessity and advantage of doing the same. May we not, therefore, pretty confidently anticipate that the cause I am advocating, will, in due time, make the tour of the world, and embrace the whole family of man in its beneficial circle.

The volumes put forth at Brussels have been sent to every cabinet in Europe and elsewhere; they will interest many speculative enquirers, and, if we once get the convictions of intelligent men with us, the rest will follow.

I ought not, perhaps, to conclude this rapid sketch of the progress of fiscal emancipation abroad, without saying a word about the position of the question in our own country, and the more so as it is remarkable that, though the principle was first shadowed forth in France, its more complete exhibition was left to be accomplished in England. Adam Smith was, as we all know, the first who placed the theory on its true scientific basis, in his celebrated work on the "Wealth of Nations;" but it was not until the year 1820 that it obtained that practical attention which has resulted in so great an increase to the moral, social, and material wealth of the countries who have most largely adopted it. On the 8th of May of that year, the following memorable petition, drawn up by the greatest economical writer of that day, Mr. Thos. Tooke, whose work on "Prices" has long been considered the standard authority on this and cognate subjects, and of which a new and greatly enlarged edition, in preparing which Mr. Newmarch assisted, has recently appeared, was presented to the House of Commons by Mr. Alexander Baring, afterwards Lord Ashburton.

"*To the Honourable the House of Commons of the United Kingdom of Great Britain and Ireland.*

"The humble Petition of the undersigned Merchants of the City of London,

"Showeth,—That foreign commerce is eminently conducive to the wealth and prosperity of a country, by enabling it to import the commodities for the production of which the soil, climate, capital, and industry of other countries are best calculated, and to export in payment those articles for which its own situation is better adapted.

"That freedom from restraint is calculated to give the utmost extension to foreign trade, and the best direction to the capital and industry of the country.

"That the maxim of buying in the cheapest market, and selling in the dearest, which regulates every merchant in his individual dealings, is strictly applicable as the best rule for the trade of the whole nation.

"That a policy founded on these principles would render the commerce of the world an interchange of mutual advantages, and diffuse an increase of wealth and enjoyments among the inhabitants of each state.

"That, unfortunately, a policy the very reverse of this has been, and is, more or less, adopted and acted upon by the government of this and of every other country, each trying to exclude the productions of other countries, with the specious and well-meant design of encouraging its own productions; thus inflicting on the bulk of its subjects who are consumers, the necessity of its submitting to privations in the quantity and quality of commodities; and thus rendering what ought to be the source of mutual benefit and of harmony among states, a constantly-recurring occasion of jealousy and hostility.

"That the prevailing prejudices in favour of the protective or restrictive system may be traced to the erroneous supposition that every importation of foreign commodities occasions a diminution or discouragement of our own productions to the same extent; whereas it may be clearly shown, that although the particular description of production which could not stand against unrestrained foreign competition would be discouraged, yet as no importation could be continued for any length of time without a corresponding exportation, direct or indirect, there would be an encouragement, for the purpose of that exportation, of some other production to which our situation might be better suited; thus affording at least an equal, and probably a greater, and certainly a more beneficial employment to our own capital and labour.

"That of the numerous protective and prohibitory duties of our commercial code, it may be proved, that while all operate as a very heavy tax on the community at large, very few are of any ultimate benefit to the classes in whose favour they were originally instituted, and none to the extent of the loss occasioned by them to other classes.

"That, among the other evils of the restrictive or protective system, not the least is, that the artificial protection of one branch of industry, or source of production, against foreign competition, is set up as a ground of claim by other branches for similar protection; so that if the reasoning upon which these restrictive or prohibitory regulations are founded were followed out consistently, it would not stop short of excluding us from all foreign commerce whatsoever. And the same train of argument, which, with corresponding prohibitions and protective duties, should exclude us from foreign trade, might be brought forward to justify the re-enactment of restrictions upon the interchange of productions (unconnected with public revenue) among the kingdoms composing the union, or among the counties of the same kingdom.

"That an investigation of the effects of the restrictive system, at this time, is peculiarly called for, as it may, in the opinion of your petitioners, lead to a strong presumption that the distress which now so generally prevails is considerably aggravated by that system, and that some relief may be obtained by the earliest practicable removal of such of the restraints as may be shown to be most injurious to the capital and industry of the community, and to be attended with no compensating benefit to the public revenue.

"That a declaration against the anti-commercial principles of our restrictive system is of the more importance at the present juncture, inasmuch as, in several instances of recent occurrence, the merchants and manufacturers in foreign states have assailed their respective governments with applications for further protective or prohibitory duties and regulations, urging the example and authority of this country, against which they are almost exclusively directed as a sanction for the policy of such measures. And certainly, if the reasoning upon which our restrictions have been defended is worth anything, it will apply in behalf of the regulations of foreign states against us. They insist upon our superiority in capital and machinery, as we do upon their comparative exemption from taxation, and with equal foundation.

"That nothing more would tend to counteract the commercial hostility of foreign states than the adoption of a more enlightened and more conciliatory policy on the part of this country.

"That although, as a matter of mere diplomacy, it may sometimes answer to hold out the removal of particular prohibitions or high duties, as depending upon corresponding concessions by other states in our favour, it does not follow that we should maintain our restrictions, in cases where the desired concessions on their part cannot be obtained. Our restrictions would not be the less prejudicial to our own capital and industry, because other governments persisted in preserving impolitic regulations.

"That, upon the whole, the most liberal would prove to be the most politic course on such occasions.

"That, independent of the direct benefit to be derived by this country on every occasion of such concession or relaxation, a great incidental object would be gained by the recognition of a sound principle or standard, to which all subsequent arrangements might be referred, and by the salutary influence which a promulgation of such just views by the legislature, and by the nation at large, could not fail to have on the policy of other states.

"That in thus declaring, as your petitioners do, their conviction of the impolicy and injustice of the restrictive system, and in desiring every practicable relaxation of it, they have in view only such parts of it as are not connected, or are only subordinately so, with the public revenue. As long as the necessity for the present amount of revenue subsists, your petitioners cannot expect so important a branch of it as the Customs to be given up, nor to be materially diminished, unless some substitute, less objectionable, be suggested. But it is against every restrictive regulation of trade, not essential to the revenue—against all duties merely protective from foreign competition—and against the excess of such duties as are partly for the purposes of revenue, and partly for that of protection—that the prayer of the present petition is respectfully submitted to the wisdom of parliament.

"Your petitioners therefore humbly pray that your honourable House will be pleased to take the subject into consideration, and to adopt such measures as may be calculated to give greater freedom to foreign commerce, and thereby to increase the resources of the state."

This petition, which contains in an epitomised form the whole argument of Free Trade, but in which no reference could be made, except by way of prophecy, to such illustrations as the subsequent adoption of the principle in this country could supply, gave rise to an animated debate, and led to the appointment of a committee in the House of Lords, at the instance of the Marquis of Lansdowne, to inquire into "the means of extending and securing the foreign trade of this country," and of one for a similar purpose in the House of Commons. The evidence supplied to these committees fully established the necessity for a change in our external commercial policy, and formed an important feature in Mr Huskisson's scarcely less celebrated speech on the silk trade, on the 24th of February, 1826. I hope I may be pardoned this reference to so remarkable an historical document in connection with Free Trade, as the firm of which I was at that time a member (Bell and Winkworth) was one of the comparatively few who had the honour, and as some thought, the temerity to sign it, especially as the trade in which I was then engaged was precisely the one which was likely to be, and eventually was, that on which the experiment, as it was deemed, was first tried. It is not often that the propounders or first advocates of theories which are pregnant with blessings on society, are permitted to see their results, but I am delighted to be able to record the fact under his own hand in a letter recently received from him, that this veteran commercial reformer, Thomas Tooke, senr., is still in the land of the living, and continues to take a deep interest in the evidence which our annual statistics of "Trade and Navigation" so abundantly afford of the soundness and success of the system he has so long and uniformly advocated.

A few more words, and I have done. We may be told, and in fact we are sometimes told by M. Dupin, the Belgian monopolists and others, that our object, after all, is of a mean and sordid nature; that it only contemplates the best mode of realising material wealth, and leaves all the more general impulses of the mind unmoved and undeveloped. My answer is, that this gives only a partial and imperfect view of the object we propose to accomplish. We say that in striking off the fetters from industry we are doing a great act of justice; for industry is the chief property of the great mass of mankind. The poor man has only his labour to give in exchange for the means of existence and the comforts of social life. To debar him from the free use of this, is to chain him to the earth, and to prevent him from asserting the true dignity of his nature.

By setting labour and capital free, we encourage industry, while we render it additionally productive; and we repress idleness, which is ever the fruitful source of vice and crime, the effects of which are painfully illustrated in the Lazzaroni of Naples and the beggars of Spain. But industry nerves the arm, braces the health, gives cheerfulness to the mind, and is in natural alliance with all the virtues which grace and adorn humanity.

The only effectual way to encourage industry is to ensure to it an adequate reward, and this is most effectually accomplished by setting it free from restrictions. Were this done universally, its tendency would undoubtedly be, other circumstances being equal, to promote a more equitable distribution of the comforts of life among the different classes of the community. In the best states of society there will be some who are poor; but the lower forms of poverty, destitution, beggary, and squalid want need not be; and where they exist, they are generally the results of vice, not unfrequently aggravated by some artificial and unjust regulations of the social system. By setting industry free, it is plain that we promote, so far as legislation can promote, the general happiness of the community, and the advance of collective man in the onward career of improvement and civilisation. We also get rid of class legislation, which is a fertile source of political discontentment. When England repealed her corn laws, she not only greatly increased her trade, but extinguished a large amount of seditious feeling, which has not since been heard of.

But another, and probably the greatest benefit resulting from Free Trade among nations, and it is the last to which I shall allude, and with which also I shall conclude this paper, already, I fear, too long, is that it naturally leads to the avoidance of war, and to the culture of the arts of peace. It obviously tends to prevent war, and even to mitigate its horrors when it can be no longer prevented.

True political economy teaches us that we are all members of one family, and that the impoverishment of one is an injury to the rest. Every article of merchandise passing between England and France tends to create an interest in each country, which is opposed to war. Manchester hates war because it stops trade, and even its patriotism was, though doubtless, erroneously, suspected of hanging fire on a recent occasion when the honour of the country was supposed to be at stake. Russia may be a worse customer to us to-morrow for every shot that we fired at her yesterday. Twice during the late war, Odessa was in our power, and twice it was spared; perhaps humanity whispered to both commanders that it would be foolish to destroy a commercial city, which we might recently have visited as friends, especially as its destruction would not tell effectually on the real objects of the war. War may be necessary and then, but not otherwise, war is just. But at all events, and whether just or unjust, it is a great calamity, and may destroy in a single moment the accumulated results of years of peaceful industry. It is true that we ought to avoid war from purely conscientious motives; but as the world at large has not yet attained to the pinnacle of moral perfection, and as the best of us may fall short of that Christian regard to our neighbours which equals in intensity the love that we feel for ourselves, it may be as well to reinforce our virtue by the less transcendental consideration, that in this case our duty and our interest are the same.

I would, therefore, urge the importance of free commercial intercourse among nations, from its tendency to prevent unnecessary wars, and to promote "peace on earth and good will among men."

It only remains for me to congratulate the Society that we are presided over on this occasion by a gentlemen so well able to appreciate the importance of the subject of my paper, as well by his large and long experience as an eminent Liverpool merchant, as by the intelligence he has brought to bear on many branches of political economy, particularly that which relates to decimal coinage. He presided over a Committee of the House of Commons appointed to investigate and report upon that subject, and made some valuable suggestions towards the solution of that difficult problem. To communicate useful knowledge has ever been his highest ambition, and his recent munificent donation in that direction to his fellow townsmen, will carry his name down to posterity as one of the greatest benefactors to the cause of moral and intellectual progress of the present age.

DISCUSSION.

The CHAIRMAN would take that opportunity of mentioning a fact which would be interesting to all, and he believed was not generally known. Previous to the breaking out of the late war, the Emperor of the French had expressed a wish to have the assistance of British knowledge in the carrying out of free-trade measures in his empire. A committee was appointed in this country, consisting of English merchants and others, of whom he (the chairman) had the honour of being one, and a sum of money was appropriated for the purpose of transmitting information as to the bonded warehouse system as carried on in this country. The breaking out of the war with Russia however interfered with the proposed arrangements, but he believed the subject would be speedily revived, and he had no doubt the information obtained would aid the Emperor in carrying out his views, which he believed to be those of an honest and sincere advocate of free-trade.

Mr. HYDE CLARKE said, as the author of the paper had made no allusion to free-trade in South America, he would offer a few remarks on that subject. The South American colonies were not represented in the Brussels Congress, but still considerable progress had been made in the principles of free-trade in that country, particularly in Chili, which might be regarded as the pioneer of civilization there. Besides the relaxation of duties upon nearly every description of raw material, and the introduction of machinery for agricultural and mining operations, which formed the staple industry of the country, the confederation of Buenos Ayres had adopted measures for the free interchange of productions between the two sides of the Andes. Progress in the same direction had also been made in other provinces of the Rio de la Plata, and generally throughout South America these principles were spreading. It had been mentioned by Mr. Winkworth that this paper would be translated into French; he (Mr. Hyde Clarke) hoped that it would also be rendered into Spanish, which was the language of no less than 40,000,000 of people, active and enterprising, and who take a deep interest in this subject, and perhaps the best means of circulating free-trade doctrines in Spain was by causing discussion upon the subject in South America, for an active intercourse was carried on between the two countries. In France, and indeed on the continent generally, the bitter feeling against England on the part of the manufacturing interests was unfavourable to the progress of free-trade. There was hardly a great public measure carried in this country which was not interpreted as intended to benefit ourselves at the expense of our neighbours. He more particularly alluded to the prejudice which even still existed with regard to the emancipation of the slaves in the West Indies. Many enlightened men were not ashamed to assert that the English had emancipated their slaves for the purpose of ruining the French colonists. It was an absurd notion, but it showed the depth of the prejudice. One great benefit arising from the discussion of this subject would be to enlist the nations of the continent in the cause of progress, peace, and commercial industry, which would not allow those opportunities for war which might otherwise be directed against us. It was a matter for congratulation to the members of the Society that they had been so ably represented at Brussels. Free-trade had ceased to be a party question; it was now a pure matter of science, and the adhesion to it of a Society having so high a reputation on the continent, could not fail to have exercised a powerful influence on the deliberations of the Congress.

Mr. SAMUEL SIDNEY said no member of the Society had a better right to offer his opinions on this subject than Mr. Winkworth. Although he belonged to one of the practical trades in the country, he had become an early convert to the principle of unrestricted commerce; but he (Mr. Sidney) was sorry that, having done him this bare justice, he could go no farther in complimenting him upon his paper. He must raise the same objection to it that he had raised some years since when Mr. Henry Cole made a proposition of a similar character to that contained in the paper now before them, viz., to convert foreign nations to the cause of free-trade by abstract reasoning. He was convinced that discussion carried on in the tone of this paper, which was unexceptional as addressed to an English community, would never have the effect of converting foreigners. It was not reasoning that brought this country to the adoption of these principles. The eloquent writings of Adam Smith and others, were no doubt convincing to the intelligent minds of the country; it was not by them, however, that the cause of free-trade was carried, but by the strong pressure of necessity. It was the potatoe famine in Ireland that created the pressure. In dealing with foreign nations he thought they were not justified in assuming a proud position for themselves in reference to this question. The fact was, people were forced into making their fortunes under the operations of free-trade, and they must endeavour to deal with foreign nations in the same way. There were three or four nations in Europe whose interest it was to adopt free-trade, but they could only be convinced of this by arguing the question from a foreign point of view; they must take up some particular calling or occupation, and show them what they would get by free-trade. Denmark might be instanced as a country which, until the introduction of free-trade, scarcely exported anything at all; but since the removal of restrictions upon commerce, tens of thousands of acres had been brought into cultivation, and large quantities of oats and barley were now grown there, and would be to a greater extent upon the development of the railway system in that country. But they could not go on reclaiming land for want of English agricultural implements. Although they had no iron, and although there was not an iron foundry in the country, yet there was a duty imposed upon English agricultural implements which almost amounted to a prohibition. In such a case it would be of no use to read an essay upon the principles of free-trade; they must lay before them an account of what the employment of English agricultural implements would do for them—what was the cost—what was the duty—and show them what immense gainers they would be if they allowed the free introduction of those implements into the country. Passing to Austria, where not long ago there was held a magnificent agricultural exhibition, yet it was a fact that ten of thousands of acres in Hungary were only waiting for the plough to yield enormous crops. Up to within a recent period serf labour was entirely employed, and agricultural implements were not much valued on that account, but the emancipation of the serfs had had the natural tendency to make labour dearer, and they were beginning to see that by our drills, our horse-hoes, and our ploughs, an enormous amount of labour might be saved; but a barrier to the introduction of these implements was raised, first by a duty on iron, and next by a duty upon the implements. The way to convince such people was not to inculcate abstract principles, but to show them what their farmers would gain by an unrestricted importation of English implements. The great exhibition in Paris last year must have cost the government not less than £50,000, whilst an equal amount was distributed in prizes. At the very time that the government was spending that large amount in promoting agricultural knowledge, there was an almost prohibitive duty upon implements that were absolutely essential to good farming. One of the greatest modern improvements in agriculture in this country consisted in the application of the superphosphate of lime to root crops in particular, but its introduction into France was prohibited on the ground that those chemical products which were not enumerated were absolutely prohibited. That was a far greater discouragement to French agriculture than could be countervailed by the prizes given in a hundred years. Another illustration of the unfavourable working of restriction was, that although a great reduction had been made upon the duties upon complete ploughs in France, ploughshares alone could not be imported. The result was, that the trade in ploughs with France was not worth the attention of manufacturers here.

Mr. AMBROSE MOORE felt called upon to express a different view as to the mode in which the inculcation of the principles of free-trade should be carried on. He admitted that it was not becoming in them to speak as if they had been long ago enlightened on this subject. Indeed, there still remained a large portion of the community who were unconvinced, whilst there were very many who had not, until recently, adopted right views with reference to it. But he must say that to address the leading public men of foreign countries upon the principles of free-trade was, in his judgment, the best mode of beginning. He adopted the opinion expressed by the last speaker, that it did not become them to boast that they adopted new principles for the benefit of the world at large, but, nevertheless, they had not sought to benefit themselves at the expense of others. The leading motive undoubtedly was to benefit our own population, but incidentally with that, other nations with whom we hold commercial intercourse were benefited. The only difference between his friend Mr. Winkworth and the last speaker, was as to the mode in which they should begin to inculcate upon others sound commercial views. Mr. Winkworth would inculcate principles, while Mr. Sidney would let the people be driven to adopt them by the pressure of necessity. That appeared to him to be very like saying they ought not to educate a physician for his profession, but they should let mankind feel the pressure of disease, and then set about effecting the cure. The author of the paper had called attention to the celebrated petition drawn up by Mr. Tooke, and presented to the House of Commons in 1820, but he had scarcely mentioned with the honour which it deserved the name of Huskisson. Mr. Sidney argued that the principles inculcated in that petition, and so ably advocated by Mr. Huskisson, were inoperative until some great pressure arrived. That pressure came in the shape of the potatoe famine in Ireland, rendering further supplies of food absolutely necessary, and then it was that the free-trade principles previously inculcated by such men as he had mentioned, were carried into practical operation; but if these principles had not been previously impressed upon the public mind, they would not have known where to turn for a remedy when the disaster occurred. He had never heard a better illustration of the doctrine of free-trade than that which was given by an operative in the stocking trade at Belper, many years ago. Food was scarcely attainable in sufficient quantity by the poorer classes, whilst, from the restrictions upon trade an enormous quantity of stockings remained unsaleable. The remark of the workman was, that as they had millions of pairs of stockings which were wanted by millions of pairs of legs in America, and as there were millions of quarters of corn in America which they could not consume, what was to prevent an interchange of the commodities which each country required. He believed if his friend Mr. Winkworth's paper were translated and circulated abroad, it would lead the way towards enabling foreign nations, when a popular necessity arose, to see the remedy they could apply; whereas, if that foundation were not laid, when the pressure came they would not know where to go for the remedy.

Dr. WATTS wished to say a word with reference to the exception which Mr. Sidney had taken to the manner in which other nations were to be converted to the true principles of trade. He enlarged upon the effects which free-trade measures had had upon the staple manufactures of Coventry—watches and ribbons, and remarked that there never was such a trade in that town as had been carried on during the last three or four years under an unrestricted policy. He added that, with regard to the watch trade, he considered the "Hall-mark" upon the cases tantamount to a restrictive duty upon them, the effect of which had been, that whilst the English manufactured watch was prized above all others by the Americans, the watch trade with that country had altogether failed. At the present time the Americans took the works of the watches from England without the cases, which they manufactured for themselves without such restrictions being imposed upon them. The watch trade had therefore suffered very greatly. He then remarked upon the spread of free-trade principles in this country by means of the abstract reasoning of Messrs. Cobden, Bright, and the other members of the league, and he believed they were still steadily extending. Between the years 1842 and 1853, there were repealed no less than 22 millions of import duties in this country, and yet the revenue of the country had not suffered. They were still collecting upwards of £20,000,000 of import duties, and of that sum they were throwing away something like 6½ millions in the shape of profit to the importers, which might otherwise be giving employment to a quarter of a million of people at the wages of £1 per week. Dr. Watts further illustrated his arguments by a reference to the restrictive influence of the excise duty upon the manufacture of paper, which he said not only tied the hands of our own manufacturers, but enabled foreigners to excel them in some descriptions of that article. He gave his cordial approval to the course which Mr. Winkworth had suggested, as a means of inculcating the principles of unrestricted trade on foreign nations.

Mr. MAY remarked that the reason why America did not take our watches was not because of any direct prohibition occasioned by the "Hall-mark," which was merely an indication that the article was of a certain quality, but on account of the higher standard of gold required in this country. They were compelled to use gold of 18 carats, whilst the Americans were satisfied with 12 carats, and, therefore, America chose to take English manufactured movements without the cases. He added, that in England they had never made watch cases separately for exportation, but they had made watches complete for all parts of the world, and whilst English chronometers were excluded by the tariff of France, it was a great compliment to a French officer to present him with an English chronometer.

Mr. F. W. BEAUMONT said, although he could give no information with regard to the iron trade in Sweden, he could state that in Prussia there was iron of as good a quality as any in Sweden, but the fiscal regulations were such that the English manufacturers could not import it.

Mr. G. A. HAMILTON, M.P., said, although he had been an honest protectionist, he felt bound to acknowledge the advantages which the alteration of our commercial system in 1846, and the establishment of free-trade had rendered to the country, and he was anxious to express the gratification he had experienced in listening to the very able paper of Mr. Winkworth. It was just what he had expected from a gentleman of his intelligence, observation, and experience, and he was quite sure that it would be the unanimous opinion of the meeting that the thanks of the Society should be rendered to him for the address he had delivered.

Professor LEONE LEVI said, that he rose with great pleasure to second the vote of thanks moved by the hon. member for the University of Dublin. In discussing the subject of free-trade, it must be remembered that there were two distinct principles; first, the abolition of protective duties, and, secondly, the abolition of duties for revenue. With regard to the first, the proceedings of the Brussels Congress could not fail to exercise a very powerful influence, and with reference to the latter, they could not ignore the fact, that the abolition of customs duties materially depended on the financial system of each country. Certain reforms might be considered advisable—protection might be given up as a principle, but when it came to be a question of revenue, then great difficulty was experienced. If it was difficult in England where the principles of taxation are so well understood, where a free Parliament and an intelligent people would be ready to sanction any system of taxation that was deemed the best, to resort exclusively to direct taxation, how much more that difficulty would be experienced in continental countries, where they had hard work to get money in any way. The proportion which indirect taxes now bore to the general revenue was very great in this as in other countries. In England, for instance, £22,000,000 were raised in Customs Duties, and £17,000,000 in Excise, in all £39,000,000, out of a total revenue of about £70,000,000. In other countries the proportion was somewhat similar. In Austria, out of a revenue of 264,000,000 florins, there were exacted 140,000,000 florins in direct taxes. Any sudden abolition of Customs Duties could not therefore be expected. As an appendix to the valuable paper which had been read, he begged to submit the practical results of the Congress in the different *voeux* or resolutions which they passed on several important points. These resolutions had distinct reference to special grievances, and they were, in fact, an able combination of abstract principles and practical remedies. The first resolution had immediate reference to the Dutch Colonies, where a good deal of monopoly still existed. The second applied to such obstructions as the Sound Dues, &c. The third and subsequent ones to Customs Duties, &c., &c.:—

1. That all that remains of the Colonial system be abolished.

2. That the river navigation which forms the means of international communication be freed from every restriction, and that all passage and transit duties existing in these rivers and straits be abolished.

3. That all that concerns the declaration of merchandise destined for importation, exportation, and transit, be subject to as simple formalities as possible.

4. That it is desirable that in all substances for food there should be a complete and permanent freedom of importation and exportation, and that this double principle be established upon the foundation of an International Law.

5. That the wine duties which, especially in England, are equivalent to a prohibition, should be subjected to a considerable reduction.

6. That the protective import duties on raw materials, such as fuel and iron, be gradually and definitively abolished within the least possible time.

7. That the legislation upon passports be modified, so as to secure the free circulation of persons without any fiscal duties, and without any *visas* being necessary for their entry into different countries.

8. That the teaching of political economy should be introduced into all educational establishments, and that teachers should be provided able to teach the science, and render it popular.

9. That in all countries a general custom-house reform shall forthwith be adopted, immediate, total and progressive, and independently of reciprocity, and that in introducing such a reform, the government will act in the interest of justice; in the general interest of nations; in the special interest of the working classes; in the interest of the protected industries themselves, and also in the interest of their own finances.

Mr. Levi concluded by seconding the vote of thanks to Mr. Winkworth.

A vote of thanks was then passed to Mr. Winkworth.

Mr. WINKWORTH begged to thank his friends for the flattering terms in which they had been pleased to speak of his paper. He regretted that time would not allow of his proving to some extent, from his own knowledge, that continental protectionists were not so insensible to reasoning as Mr. Sidney had asserted. In his (Mr. Winkworth's) Report to the Board of Trade on the Silk Department of the Paris Exhibition, and in other documents, he had quoted passages from his correspondence with manufacturers and his co-jurors in France, Switzerland, Prussia, and Austria, testifying to the progress of the great principle he was advocating in the public mind. During the past year such testimonies had largely accumulated, and he was sanguine enough to expect, as his friend Mr. Moore had so ably argued from past experience in this country, that when circumstances sufficiently urgent or encouraging arose, the governments of other countries would be prepared to carry out the doctrines of free-trade in all their integrity. His paper had elicited facts and arguments in the course of the discussion which were valuable as contributions to what, he hoped he might, without presumption, call the cause of humanity.

The Secretary announced that, on Wednesday evening next, the 27th inst., a paper "On some Combinations and Phenomena that occur among the Elements engaged in the Manufacture of Iron, and in the Conversion of Iron into Steel," by Mr. Christopher Binks, would be read.

FRANKFORT PHILANTHROPIC CONGRESS, 1857.

At a Conference held at Paris in 1855, under the auspices of the Sociéte d'Economie Charitable, it was agreed that International Congresses should be held, if possible, from year to year, in the chief cities of Europe, for the discussion of subjects having a practical bearing on the welfare of the industrious classes.

The first of these Congresses was held very successfully at Brussels, in the autumn of last year, and was attended by several members of the Society of Arts, including a deputation from the Council, who fully appreciated the intimate connexion between the welfare of the working population and the prosperity of Arts, Manufactures, and Commerce. It will be seen by the subjoined programme, that among the subjects selected for discussion at the next Congress is that of Industrial Instruction, to which the Council of the Society of Arts has given such important furtherance by instituting the system of Examinations. The Congress will also take into consideration the system of *patronage*, or protection and assistance of apprentices, for which much has been done in some parts of the continent, and of which the value will be appreciated by all those who are acquainted with the defects of the present system of apprenticeship in England.

The following document has been issued by the Managing Committee at Frankfort:—

" At the International Philanthropic Congress, which met at Brussels, in September, 1856, it was decided that the Congress should be placed upon a permanent basis, and instructions were given to the Committee of Management to take the necessary steps for carrying out this resolution. After consultation with the Vice-Presidents and Foreign Delegates, the Committee determined that the second meeting of the Congress should be held in 1857, at Frankfort-on-the-Maine, the central situation of which would be convenient to the delegates from all parts of Europe.

" The town of Frankfort has responded favourably to this proposal, and a Committee has been formed, which, in conjunction with that at Brussels, has drawn up the following programme of questions to be discussed at the next meeting.

SECTION I. (CHARITY.)

1. The object and limits of public relief. Should this be confined to affording board and lodging in a workhouse to those relieved?

2. The position of domestic servants; means of ameliorating the condition of servants of both sexes.

3. Co-operation of employers of labour for the amelioration of the condition of the employed. The question of combining charitable or provident institutions with manufacturing and agricultural establishments.

4. The means of remedying the abuse of strong drinks, and stopping the progress of intemperance.

SECTION II. (EDUCATION.)

1. The means of encouraging, improving, and extending popular education. The question of compulsory attendance at school. The combining school education with apprenticeship. Assistance to apprentices *(patronage des apprentis)*.

2. Education of infants; public nurseries; infant schools, or Kinder-gärten.

3. Organization of elementary instruction in manufactures and agriculture.

SECTION III. (PRISON REFORM.)

1. Results, both physical and moral, of the solitary system in various countries.

2. What are the proper limits within which this system should be confined?

3. Should the ticket of leave system (*liberations provisoires ou conditionelles*) be admitted, and if so, under what conditions?

4. The state, progress, and results of reformatory institutions in various countries, such as penitentiaries, reformatory schools, agricultural reformatory settlements, &c. Their effect on young delinquents, beggars, and tramps, vicious children, and those that have been utterly neglected.

" These questions have been chosen from amongst those which rightly occupy the attention of legislators, and of all who are strongly convinced of the necessity for improving the condition of the working and indigent classes. Several of them had already been recommended for discussion at the Congress at Brussels.

" The division of the Congress into three sections will be similar to that at Brussels, and the arrangements adopted there will be followed, with the exception of any modifications which may be found desirable.

" A detailed plan for the settlement of the questions proposed will be submitted to the assembly before the opening of the regular debates. Any members who may have proposals or communications to make, are requested to communicate with the Secretary without delay.

" It is also desired that, in the same manner as at Brussels, foreign delegates should agree to furnish an account of the condition of the working classes in their respective countries, mentioning at the same time the most recent measures that have been taken to improve it.

" The sittings of the Congress will open on Monday, the 14th September, 1857, at 11 a.m., in the place mentioned on the tickets of admission. These tickets will be delivered on and after the 10th September, from 10 to 4 o'clock, at No. 6, Hochstrasse, Frankfort, on payment of 20 francs.

" This sum is intended to defray the expenses of the meeting, and of printing and publishing the report of the debates, of which a copy will be sent to every member.

" The Congress at Brussels has shown the great importance of these Philanthropic Meetings, where men of all nations come to exchange their ideas, and to place their experience at the service of all. Thus, all that has been already done becomes known, improved means are suggested, and the members mutually encourage each other to proceed with their charitable mission. The success of the first Congress leads to the hope that the ensuing meeting at Frankfort will be equally numerous and equally useful.

" All communications relative to the International Philanthropic Congress at Frankfort, should be addressed (paid) to the Secretary to the Committee of Management, *M. le Docteur* G. VARRENTRAPP, *Hochstrasse*, No. 4, *à Francfort-sur-le-Mein.*"

Members of the Society of Arts purposing to attend the Congress are invited to make their intentions known to the Secretary of the Society of Arts, or to Mr. T. Twining, jun., the Society's referee for Foreign Correspondence, who will report them to the Frankfort Committee, and transmit any documents of the nature specified in the programme.

Home Correspondence.

EXAMINATIONS.

SIR,—I see that you have published in the Society's *Journal* my letters to the Master of Pembroke College, Oxford, ' On Middle Class Education," and a letter from Dr. Booth to the *Daily News* commenting on my proposal.

I am anxious to correct one misapprehension into which Dr. Booth has fallen, and into which he may perhaps lead the readers of the *Journal*. He says, " It is objected to the Society of Arts' scheme that a considerable latitude of choice is allowed," and the context implies that this objection is made by me. I can assure him that I look upon this feature of the scheme as an excellence, not as a defect, and should be very sorry to see it altered. The scheme adopted by the Society was primarily intended for members of Mechanics' Institutes, that is, speaking generally, for men who, being engaged in various occupations during the day, devote their evenings or spare time to private study or to attendance at an evening class. It is hardly possible to allow such men too much latitude of choice among the subjects of study.

I am, &c.,
F. TEMPLE.

Carnarvon, May 18, 1857.

PARLIAMENTARY REPORTS.

SESSIONAL PRINTED PAPERS.

PAR. NO.

Delivered on May 2, 4, and 5.

148. Hong-Kong—Return.
154. Dietaries for Convicts, &c.—Returns.
134. Civil Appointments (Army and Navy)—Returns.
149. Malta—Correspondence.
Prisons—20th Report of the Inspectors (Northern and Eastern District), Part 2.
Inland Revenue—1st Report of the Commissioners.
Cape of Good Hope (Kaffir Tribes)—Further Papers.
Colonial Possessions—Reports.

Delivered on 9th and 11th May.

1. Bills—Transportation and Penal Servitude.
3. ——— Industrial Schools.
Canton—Further Papers.
Portendic and Albreda—Convention.
Prisons—22nd Report of the Inspectors (Southern and Western District), Part 3.

Delivered on May 12.

2. Harbours, &c. Bills—Birkenhead Docks Construction; Birkenhead Docks Management; Liverpool and Birkenhead Docks (Rates); Liverpool Dock Committee and Birkenhead Docks; Mersey Conservancy and Dock; 1, St. Helen's Canal and Railway; 5, Clyde Navigation; 3, Weaver Navigation; 4, Elie Harbour; 5, Fraserburgh Harbour; 6 Great Yarmouth Britannia Pier; 7, Lowestoft and Burgh St. Peter Ferry and Roads; 8, Swansea Harbour Trust and Dock; 9, Briton Ferry Docks; 10, Norfolk Estuary; 11, Sunken Vessels Recovery (limited); 12, Swansea Docks; 13, Nene Valley Drainage and Navigation Improvement; 14, North Level Drainage; 15, Wearmouth Bridge, Ferries, and Approaches; 16, Victoria (London) Docks; 17, Watchet Harbour Trust and Watchet Harbour; 18, Ely Tidal Harbour and Railway; 19, Liverpool Town and Dock Dues (St. Helen's Canal and Railway); 20, Tyne Improvement; 21, River Slaney Improvement—Board of Trade Reports.
2. Bills—Registration of Long Leases (Scotland).
——— Judgments Execution, &c.

Delivered on May 13.

1. Public Income and Expenditure (Balance Sheet)—Account.
6. Committee of Selection—1st Report.
10. Merchant Seamen's Fund—Account.
12. Increase and Diminution (Public Offices)—Abstract of Account.
13. Navy Estimates.
14. Post-office Department (Packet Service)—Estimate.
5. Bill—General Board of Health.
National Vaccine Board—Annual Report.
Sound Dues—Report of Mr. Buchanan.
—————Treaty, Protocol, and Convention.

MEETINGS FOR THE ENSUING WEEK.

MON. Geographical, 1. Anniversary.
Linnæan, 1. Anniversary.
TUES. Royal Inst., 3. Dr. J. P. Lacaita, LL.D., "On Italian Literature—Tasso."
Meteorological, 7. Mr. Campbell, "On a new self-registering Sun Dial."
Med. and Chirurg., 8½.
Zoological, 9.
Civil Engineers, 9. President's Annual Conversazione.
WED. London Inst., 3. Prof. Robert Bentley, "On Systematic Botany, with especial reference to the natural systems of arrangement."
Society of Arts, 8. Mr. Christopher Binks, "On some Combinations and Phenomena that occur among the elements engaged in the manufacture of Iron, and in the conversion of Iron into Steel."
Archæological Association, 8½.
THURS. Royal Inst., 3. Prof. J. Tyndall, "On Sound, and some associated phenomena."
Royal Society Club, 6.
Antiquaries, 8.
Royal, 8½.
FRI. Ethnological, 8. Anniversary.
Royal Inst., 8½. Prof. A. J. Scott, "Physics and Metaphysics."
SAT. Royal Inst., 3. Prof. E. Frankland, "On the Relation of Chemistry to Graphic and Plastic Art."
Royal Botanic, 3¾.
Medical, 8.

PATENT LAW AMENDMENT ACT.

APPLICATIONS FOR PATENTS AND PROTECTION ALLOWED.

[*From Gazette, May* 15.]

Dated 12th February, 1857.

412. Thomas Turner Grosvenor-street, Commercial-road East, and Henry Boyens, George-street, Commercial road East—Improvements in apparatus for steering ships and vessels, and in apparatus for communicating or signalling between the deck and engine-room of steam vessels.

Dated 17th March, 1857.

744. Charles Askew, 27½, Charles-street, Hampstead-road, John Askew, 27, Charles-street, Hampstead-road, and Henry Myers, 60, Upper Charlotte-street—Improvements in hydraulic and refrigerating apparatus for the purpose of raising sunken vessels, anchors, and all other submerged bodies, with light and other certain apparatus used for the same purposes.

Dated 20th March, 1857.

780. Edward Gripper, Winchester Wharf, Bankside, Southwark—The treatment of the fruit or vegetable "algorabas," and in the application of the same as food for cattle.

Dated 25th March, 1857.

830. George Douglass Early, and John William Edmonds, Camberwell—A method of producing glass designs, figures, and patterns.

Dated 6th April, 1857.

966. Charles Goodyear, Leicester-square—Improvements in the manufacture of waterproof boots and shoes, applicable also in part to boots and shoes of other kinds, and to other outer coverings for the feet.

Dated 15th April, 1857.

1062. Robert Knowles, Manchester—Certain improvements in power looms for weaving.
1064. Louis Barnett, 5, New-street, Bishopsgate—Improvements in the making and cutting out of garments.
1066. Charles Goodyear, junr., Leicester-square—An improved manufacture of paper knife.
1068. James Payne, Kirkcudbright—Improvements in scythes.
1070. Jacob Safran, Wellclose-square—Improvements in locking or fastening combinations of drawers in chests, tables, nests, or otherwise.

Dated 16th April, 1857.

1072. John Sudbury and Alfred William Linsell, Halstead, Essex—An improved gas-regulator.
1074. Thomas and Frederick Sugden, Oldham—Improvements in sewing machines.
1076. William Weild, Manchester—Improved arrangements for printing, dyeing, colouring or staining, and otherwise preparing yarns or threads for various manufacturing purposes.
1080. James Warburton, Addingham, near Otley, Yorkshire—Improvements in preparing and combing wool and other fibres.
1082. James Warburton, Addingham—Improvements in carding machinery.
1084. James Warburton, Addingham—Improvements in preparing and combing wool and other fibres.

Dated 17th April, 1857.

1088. Edward Oldfield, Adelphi Iron Works, Salford—Improvements in self-acting mules for spinning and doubling. (Partly a communication.)
1090. Jean Marie Leonidas Caillaud, Marshgate-lane, Stratford, Essex—Improvements in removing the fur from the skins of rabbits, and in preparing rabbit, calf, and other skins for tanning.

Dated 18th April, 1857.

1092. John Smith, Kidderminster—Improvements in the manufacture of carpets.
1094. Thomas Harris, Shiffnall—Certain improvements in the mode of constructing and applying horseshoes.
1096. David Hunter Brandon, 7, Rue des Moulins, Paris—Improvements in fastenings for shutters, windows, doors, &c. (A communication.)
1100. Gustav Jahn, 43, Bedford-row—Improvements in revolver fire-arms.
1102. Charles Richard Barnes, New York—Improvements in means for hulling and cleaning rice, and other grains having a hull or husk.

Dated 20th April, 1857.

1106. Richard Ford Sturges, Birmingham—A new or improved manufacture of metallic pens.
1110. Robert Tindall, junr., Fraserbugh, Aberdeen, N.B.—Improvements in harpoon guns and ammunition.
1112. John Underwood, Gloucester-road—An improved method of printing, and of preparing materials employed therein.
1114. William Edward Newton, 66, Chancery-lane—Certain improvements in meters for measuring the flow of gas, water, or other fluids. (A communication.)

Dated 21st April, 1857.

1116. Henry Wimball, Aldermaston, Berkshire—Improvements in pug mills.
1118. William Crighton, Manchester, and Peter Foxcroft, Pendleton—Improvements in machinery or apparatus for preparing cotton, wool, or other fibrous substances to be spun.
1120. William Gossage, Widnes, Lancashire—Improvements in the manufacture of certain kinds of soap.
1122. Edwin Marten, Pratts-row, Phipps-bridge, Mitcham—Improvements in apparatus for regulating the pressure and supply of gas.

1124. Henry Smart, 17, Queen's-terrace, Bayswater—Improvements in organs.

Dated 22nd April, 1857.

1128. Thomas Burton, Padiham, Lancashire, and Simeon Lord, Burnley—An improved self-acting steam pipe regulator, which is also applicable to drying cylinders, and other similar purposes.

1129. James Higgin and John Lightfoot, Manchester—An improved compound and improvements in the method of applying the same for the purpose of stiffening fibrous or textile materials, the same being applicable to the fixing of colouring matters or pigments.

1130. William Williams, Liverpool—An improved propeller for propelling ships, boats, and other vessels.

1132. William Kendall, Blawith, Ulverstone, Lancashire—Improvements in the manufacture of boxes and similar articles, and in the machinery or apparatus to be employed therein.

1134. Robert Taylor, Richard Worswick, and John Lovatt, Ipswich—Improvements in railway chairs, and in the mode of securing the ends of rails therein.

1136. Richard Boxall Grantham, 7, Great Scotland-yard, and John Grantham and Henry Sharp, Liverpool—Improvements in graving docks.

1138. William Robertson, Manchester—Certain improvements in machines for preparing to be spun cotton and other fibrous materials.

Dated 23rd April, 1857.

1144. James Morison, Paisley—Improvements in portable shower and sponge baths.

1146. George Scarr and James Pollard, Burnley—Certain improvements in power looms for weaving.

1148. John Garnett, 81, Wells street, Oxford-street—Improvements in the construction of corsets.

1150. Rudolph Bodmer, 2, Thavies-inn, Holborn—Improvements in safety valves for steam boilers. (A communication.)

1152. Albert Demerit Bishop, Woolwich—An improvement in the construction of windlasses.

1154. Alexander la Paraz, 10, Gloucester-place, Portman-square, and Josephine Mazel, 16, King-street, Portman-square—Improvements in preparing paints and varnishes. (A communication.)

Dated 24th April, 1857.

1158. Robert Fowler Swift and Richard Swift, 7, Wharf, Wenlock-road, City-road, and John Cormes, Balmes-road, Hackney—Improved machinery for washing, wringing, and mangling clothes or fabrics.

1160. William Clark, 53, Chancery-lane—Improvements in machinery or apparatus for embroidering. (A communication.)

1162. Thomas Craddock, 137, Tachbrook-street, Pimlico—Certain improvements in the steam engine and the steam boiler.

Dated 27th April, 1857.

1180. Charles Cowper, 20, Southampton-buildings, Chancery-lane—Improvements in electro-plating and depositing metals. (A communication.)

1182. William Thompson and Hamilton Woods, Spring Gardens Engine Works, Newcastle-on-Tyne—Improvements in lowering weights by means of cranes, winches, or similar apparatus.

1184. Peter Armand le Comte de Fontainemoreau, 4, South-street, Finsbury—Improvements in obtaining motive power. (A communication.)

1186. Alfred Eddington, Springfield, Chelmsford—Improvements in machinery for ploughing, tilling, and draining land.

1188. William Levesley, Sheffield—Improvements in manufacturing the blanks of forks, scissors, cutlery, chisels, and other tools, which improvements are applicable to the manufacture of springs for pocket knives, and other like articles, now prepared by the forging process.

Dated 28th April, 1857.

1195. William Armand Gilbee, 4, South-street, Finsbury—An improved mode of reefing and reducing top-sails. (A communication.)

1197. Wright Jones, Pendleton, and Thomas Edwards, Eccles—An improved lubricator.

1199. George Newton, Upper Thames-street—improvements in copying and other presses.

Dated 29th April, 1857.

1203. John Aitken, Essex-street, Islington—An improvement in furnaces for melting the materials of glass, iron, and other metals, and for boiling water and other substances.

1205. William Joseph Curtis, Crown-court, Old Broad-street—Improvements in apparatus to facilitate passengers ascending to and descending from the roofs of omnibuses.

1207. François Menusier, 39, Rue de l'Echiquier, Paris—An improved bee-hive.

1209. George Bartholomew, Linlithgow, N.B.—Improvements in tanners' and curriers' knives.

Dated 30th April, 1857.

1215. Barnard Barcroft, Radcliffe-hall, near Manchester—Improvements in dyeing and printing.

1217. John McDowall, Walkinshaw Foundry, Johnstone, Renfrew, N.B.—Improvements in steam hammers.

1219. William Edward Newton, 66, Chancery-lane—Improved machinery for moulding and pressing bricks. (A communication.)

1221. George Powers, Wellclose-square—An improved scuttle for ships.

1223. Samuel Robert Lewis, 11, Catherine-street—Improvements in trowsers.

1225. John Collins, Birmingham—Improvements in furnaces and flues, and in kilns and drying chambers.

Dated 1st May, 1857.

1227. John Avery, 32, Essex-street, Strand—An improved washing or fulling machine. (A communication.)

1229. Edward Hawkes, Birmingham—New or improved machinery for the manufacture of pipes for smoking.

1231. John Henry Johnson, 47, Lincoln's-inn fields—Improvements in apparatus for preventing collisions at sea. (A communication.)

1233. Richard Leake and Matthew Sykes, Barnsley, Yorkshire—Improvements in consuming smoke and generating heat in furnaces of steam engine or other boilers, also heating the feed water of the said boilers, therefore economizing fuel to a great extent.

Dated 2nd May, 1857.

1235. Edward Tucker, Belfast—Improvements in the manufacture of starch.

1239. Charles Chatel, 45, Essex-street, Strand—Improvements in the manufacture of blinds, screens, reflectors, and other articles of a similar nature.

1241. Joseph Davy and William Bentley, Bradford, Yorkshire—Certain improvements in looms for weaving fibrous substances.

1243. Adolphe Louis Cauville, Hotel des Bains, Passage du Saumon, Paris—Improvements in the manufacture of shoes and boots.

1245. John Marland, Lawrence, Massachusetts, U.S.—Improvements in cop tubes used in spinning.

WEEKLY LIST OF PATENTS SEALED.

May 15th.

2704. Andrew Barclay.
2711. Christopher Binks.
2720. William Healy.
3724. Samuel Dyer.
2735. Thomas Hindle.
2745. Peter Armand le Comte de Fontainemoreau.
2795. John Palmer.
2823. John George Taylor.
2843 Francis Peabody.
2855. John Fowler, jun.
2857. Robert Dryden and Stephen Miles.
2947. Wm. Colborne Cambridge.
3041. Wm. Edward Newton.
167. Thomas Johnson.
233. John Henry Johnson.
539. Joseph Betteley.
649. George Bower.
773. William Reid.
833. Alfred Vincent Newton.

May 19th.

2736. George Watson and Cornelius Satterthwaite.
2739. Samuel Fox.
2741. Samuel Fox.
2757. John William Clare.
2762. William Jacobs.
2763. Joseph Barrans.
2765. Rd. Archibald Brooman.
2768. Alexander Clark.
2771. Alexander Robert Terry.
2774. Joseph Wheeler.
2775. Rd. Archibald Brooman.
2776. John Skirrow Wright.
2787. Henry Brickley.
2852. Rd. Archibald Brooman.

Patents on which the Stamp Duty of £50 has been Paid.

May 11th.

1058. Christopher Nugent Nixon.

May 12th.

1065. Moses Poole.
1109. James Coley March.

May 13th.

1196. Henry Doulton
1217. James Timmins Chance.

May 14th.

1099. Christopher Catlow and Thomas Comstive.
1403. Emile Hubner.

May 15th.

1111. John Maclean, junr., and Thomas Finlayson.

May 16th.

1147. Louis Emile Dufour.

WEEKLY LIST OF DESIGNS FOR ARTICLES OF UTILITY REGISTERED.

No. in the Register.	Date of Registration.	Title.	Proprietors' Name.	Address.
3983	May 14.	A Truss	Peter Gadsby	Derby.
3984	,, 16.	The Cork Compresser and Bottle Corker	Henry Levy	Sheffield.
3985	,, ,,	Telegraph Insulator	George Grainger	Worcester.
3986	,, ,,	A detached Elliptic Spring for Carriages	Henry Black and Co.	Berners-street, Oxford-street.
3987	,, 19.	Drawers or Pantaloons	Fann and Lamb	Nottingham.
3988	,, 20.	Night Latch	John Young	Wolverhampton.
3989	,, ,,	Improved Adjustable Plough	John Webb	Hawkedon, Suffolk.
3990	,, ,,	The Oriental Shirt Collar	Welch and Margetson	Cheapside.

Journal of the Society of Arts.

FRIDAY, MAY 29, 1857.

NOTICE TO MEMBERS AND INSTITUTIONS.

The prizes awarded by the Society's Examiners to the successful Candidates at the June Examination in London will be distributed on the morning of Tuesday, the 23rd of June, at the Society's House in the Adelphi.

The Society's Annual Dinner will take place at the Crystal Palace in the afternoon of the same day. Lord Stanley, M.P., will preside.

The Sixth Annual Conference of the Representatives from Institutions in Union with the Society, is appointed to be held at the Society's House on Wednesday the 24th of June.

The Annual General Meeting for receiving the report of the Council and the Treasurer's statement of receipts, payments, and expenditure during the past year, and also for the Election of Officers, will, in accordance with the Bye-Laws, take place at 4 o'clock on the same day.

ART-TREASURES EXHIBITION.

The period fixed for the Society's visit to the Manchester Art-Treasures Exhibition, is the week commencing the 30th of July.

A Local Committee has been formed in Manchester to make arrangements for the Society's reception there.

That Committee is desirous of knowing, as early as possible, the number of members likely to visit Manchester, in order that information respecting hotels and lodgings may be obtained.

The Committee are making application to the principal Societies, the Exchange, and various large manufacturers, for the admission of members of the Society of Arts, during their visit, on showing their cards of membership.

TWENTY-THIRD ORDINARY MEETING.

Wednesday, May 27, 1857.

The Twenty-third Ordinary Meeting of the One Hundred and Third Session was held on Wednesday, the 27th inst., William Fairbairn, Esq., F.R.S., in the chair.

The following Candidates were balloted for and duly elected members of the Society :—

Alger, John
Bird, Henry Harrington
Botten, Charles, jun.
Clarke, William
Fielden, Joshua
Gamble, George
Ingham, Robert, M.P.
Masterman, C. T.
Shelley, Charles Percy Bysshe
Smith, J. B., M.P.
Spice, R. P.
Walls, Andrew
Watney, Daniel, jun.
Watts, John, Ph. D.
Winfield, John Fawkner
Wood, Thomas

As a Corresponding Member.

Buist, George, LL.D., F.R.S.

The paper read was :—

ON SOME COMBINATIONS AND PHENOMENA THAT OCCUR AMONG THE ELEMENTS ENGAGED IN THE THE MANUFACTURE OF IRON, AND IN THE CONVERSION OF IRON INTO STEEL.

By Christopher Binks.

1.—*Introductory.*

The existing and generally received theory of the formation, and the alleged actual composition of steel, have ever appeared to have in them points that are not quite satisfactory. But it is probably owing to the fact that chemistry, throughout its whole range, is so replete with instances in which extraordinary effects or phenomena follow from insignificant causes, or from causes apparently inadequate to produce them, that this instance of the alleged composition of steel has been allowed hitherto to pass unquestioned generally.

The magical effects (as seen in its assumption of properties so singular and distinctive) of the addition to pure iron of some apparently insignificant proportion of carbon, is a conspicuous instance of this kind of chemical anomaly. That simple combination is, and has ever been alleged to be the sole cause of the conversion of the iron into steel. Carbon has been the only tangible or apparent element brought in contact with the iron in the act of its conversion; and after analysis of steel has detected in it, or assigned to it as essential, the existence of iron and carbon only. Therefore has this explanation ever been generally accepted without misgivings; and, solely to this simple combination, has ever been, and still is, attributed the conversion, and consequent assumption by the iron, when it becomes steel, of properties so distinctive and peculiar. Still the broad distinctions that exist in their mechanical or physical properties between steel on the one hand and malleable iron, or cast-iron, on the other, would seem to leave room for great doubt that the cause of these distinctions is due solely to the absence in the one, and to the presence in the other, of the element carbon, or to the merely minute differences in the relative proportions of that element that are found in steel and in cast-iron. Yet everywhere is this the received formula of the composition of steel; namely, that it consists solely of about 99 parts of pure iron combined with one part of carbon; and any other matters that, in extremely minute proportions, analysis may have, from time to time, or occasionally, detected in it, have been considered as foreign and accidental only,—and as being in no way essential to, but rather as interfering with, its true chemical composition and character. In this light, for example, have been looked upon the minute proportions of manganese found in some descriptions of steel, and also the appearance of nitrogen developed during analytical operations. The former (howsoever its presence may be considered to modify some mechanical property of the steel) has never been deemed essential to its chemical composition when the steel is in its normal or pure state; whilst the latter has ever been held (when recognised or detected at all) as the result of some merely mechanical adherence of that element to the metal, or to have been derived from the re-agents present on analysis. The same reasoning has been applied to some other (so-called) foreign or accidentally present matters; and steel has, consequently, ever since the doctrines of modern chemistry began to be applied in reasoning upon it, been looked upon as simply a compound of iron and of carbon, and as such, and such only, it would appear to be held to be even up to the present hour.

The same chemical doctrine of composition has always influenced, and still continues to influence, the selection of materials to be used as re-agents in the formation of steel, or for the conversion of iron into steel. Hence, to effect this conversion, it has ever been deemed needful only to bring heated iron in contact with carbon, or with some carbon compound, in order that the iron shall take up the one per cent. or thereabouts, considered as essential to steel; and hence, also, the selection of charcoal as this re-agent principally; and whenever other re-agents may have been taken and used as aids or substitutes, leather shavings, for example, this selection also has always been made on the same general principle that it was the carbon alone that was to be absorbed by the metal. It will be seen, however, that notwithstanding this guiding idea of the steel-makers, either accident alone, or some theory of the quality of the carbon in these specially selected materials, has undesignedly led to the employment of the very elements along with the carbon that the production or the chemical composition of steel demands; and which other elements existing theory would either have altogether rejected, or certainly never have especially sought for. This is another instance in which inadvertent experiment alone has furnished the solution of a problem; and in which the chymist, or the theorist, learns his first real lesson from the artizan; or obtains from him his most important data upon which to apply the higher reasoning of his science.

Bearing in mind the broad facts as seen in the distinctive physical properties of steel and of iron, and the unsatisfactory character of the carbon-per-centage explanation of these remarkable distinctions, is it not possible that a careful examination of the daily operations used to produce steel may exhibit the existence of some other phenomena, or the action of some other elements playing as important a part, either in the operations or in the ultimate composition of the steel, as that hitherto supposed to be fulfilled by carbon alone?

He who would enter upon the experimental solution of a question of this kind must rejoice to have prepared to his hand so active and so magnificent a laboratory as that provided by the iron and steel manufactories and the workshops of this country. Let any one, with or without an implicit belief in the stereotyped and re-stereotyped doctrines of the encyclopædias, make a pilgrimage to Sheffield, and among the multifarious operations of the converting houses, and of the tool makers, he will speedily discover enough to shake his faith in the old doctrine, and facts enough upon which to reason in search of a new one.

He will perceive, for one instance, that the old cementation process, the avowed object of which is to bring into and keep in contact highly heated iron and carbon, in order simply to effect a combination between these two, is by no means of the uncomplicated character such simple conditions would imply. He will find, too, among the higher and thinking classes of that busy world, a growing conviction of the insufficiency of the old theory—a conviction such as that which recently led Mr. Saunderson (one of the highest and most experienced of steelmakers) to state, in effect, that "the abstraction from cast metal, containing five per cent. of carbon, of four-fifths of that quantity does not necessarily result in the conversion of that iron into steel, and that the abstraction from pig or cast iron of the entire quantity of the carbon proper to cast metal, does not result in the conversion of the cast into malleable iron." In other words, in this statement of one ever surrounded with practical evidences, and habituated to the considerations they lead to, we have it given, as the result of such considerations, that the notion generally entertained is an erroneous one—that steel is merely iron combined with about one per cent. of carbon, and that malleable iron is merely iron without any carbon at all, or with less carbon than that requisite to form steel.

It would appear that in this quarter as well as in others, there exists a clear impression that the relation between the proportions of iron and of carbon is not the only thing that determines the character of the metal; that there is something beyond this upon which the distinctive properties peculiar to cast metal, peculiar to malleable iron, and peculiar to steel, respectively depend—that, super-imposed upon this merely chemical constitution, this adjustment of relative proportions of elements,—there exists a something to which, equally with such adjustment, are due those physical properties that so remarkably distinguish these different kinds of iron. What, then, is this something? Is it some peculiar molecular arrangement or formation, or crystalline structure of the iron—some merely molecular arrangement of particles superinduced, permitted, or interfered with according to the presence or absence of other elements—that is, according to the purity or impurity of the metal? Is steel pure iron with just as much carbon in it as (conjoined to some molecular disposition of its particles) preserves it from external influences and change? or that subserves some purpose of conservation? Or is it the fact that there is combined with the iron, when it assumes the properties of steel, some other element besides carbon?

II.—*Varieties of Steel Proper, and of Iron Compounds that in some properties resemble Steel, and how best to distinguish these.*

Before proceeding with my examination of already known circumstances under which iron is converted into steel, or steel into iron, or before instituting any special line of research for developing new facts upon which to reason as to the actual conditions and results mechanical or chemical of conversion, it is needful to define what steel really is physically, that is, what distinguishing properties it possesses, which taken independently of its chemical composition shall constitute an easy and incontrovertible test; or, in other words, shall enable us clearly to distinguish steel proper from iron compounds, or alloys of iron with other metals, or mixtures of iron with non-metallic elements, which in some respects resemble but are not real steel.

Steel is contradistinguished from all other compounds by its capability of receiving different degrees of hardness, and a degree of hardness comparatively superior to any other metal; by its elasticity under certain kinds of treatment, its capability of receiving a fine and a peculiar polish, by its development of certain different colours under different degrees of heat, and by the permanency of the action upon it of induced magnetism. It is distinguished from pure iron by the complete absence in the latter of any one, or degrees of any one, of the properties just enumerated. But there are compounds of iron that exhibit some, but not the whole of the special properties of steel. The outer coating of common cast-iron when "chilled," or when the casting has been made in sand, is often as hard and as untouchable by the file as the best tempered steel itself. There exist also alloys of iron (as of iron with manganese and with other metals, such as those that were investigated by Stoddart and Faraday,) that in the property of hardness alone are scarcely inferior to the finest steel. But in none of these special compounds are there associated the whole of the peculiar physical properties, the collection or series of which distinguish steel from any other substance. The peculiar effects in modifying its normal properties of an admixture with steel, or with pure iron, of phosphorus, sulphur, silicium, &c., are pretty well understood, but it is the varieties of steel, the results of admixtures with steel proper of non-converted iron, in various proportions, that constitute the real difficulties of discrimination, and for these there exists no special test.

Place in the hands of an experienced steel worker (a filemaker, a razor, a watch spring, a needle, or a surgical instrument maker for example) a piece of rough, black, and unworked steel, part of a bar of cast steel for instance, and ask him what metal it is. He will not judge of it by its specific gravity, nor by application to it of nitric acid, or of any other chemical test, but will proceed most probably as follows:—He will balance it on his hand, and tapping it with a hammer, will bring out its "ring" as he calls it, the peculiar intonation of which in steel, as compared with the tone of iron, is, to his practised ear, a specific and infallible test of kind, and almost exactly of quality. He will next make it red hot and try how it "draws," that is, by repeated blows, will elongate the bar, watching as he proceeds the texture of the metal, its adhesiveness, its flexibility, its indisposition to scale, and the character of the marks inflicted upon it by his hammer. When it is good steel upon which he is working, the sharp-edged well-defined impressions of his hammer's face (so finely developed, indeed as to reproduce even the grindstone lines that are left on the face of a recently ground hammer,) but when it is with iron or bad steel that he his working, then the shapeless and ill-defined impressions that result, give to his practised eye all the information he seeks for as to the real quality of the metal he is handling. Next he will try the temper of his forged specimen—heat it to some known degree and after dipping it in cold water, test its degree of hardness by the file. Still further, in proof, he will next fracture the forged and tempered specimen, and through its grain find another evidence of its character. If the fracture be a clean one, close-grained, compact and silvery—it is steel,—if ragged, fibrous, and leaden-hued, it is iron, or it will be one or other of these, with such intermediate gradations as correspond to all the differences in quality that lie between these two extremes. Next he will polish its surface and gradually heating the specimen, he will, as the temperature rises, watch that peculiar arrangement of colours, that in their special brilliancy are peculiar to real steel alone, the assumption, first, of various shades of yellow, deepening as the heat increases almost into brown, then successively into greenish blue, with pure blue and into purple—upon which there follows another kind of change—a disruption of the constitution of the metal to which is due that play of colours and the oxidation of the surface. Finally, as the *ne plus ultra* of his testings, he will proceed, probably, to forge out of his specimen a turning tool, or preferably a cold chisel, and then with the latter, cutting for awhile at a piece of cold cast-iron, will at once pronounce upon the kind and the quality of the metal, and the exact purposes to which it is best applicable. Now, from the nature of the case, the chemist must imitate or select from these practices of the handicraftsman, (for there exists no special test), and the file test, after tempering, together with the colour test under high and different temperatures, affords sufficiently accurate tests for most of the purposes of the laboratory.

III.—*What the Examinations of some known Processes of Conversion would appear to indicate.*

The searcher for information among the steelmakers and steelworkers will speedily find abundance of instructive and suggestive facts, the careful study of any one of which may possibly give him the clue he seeks for. Let him, for example, in the first instance carefully examine the phenomena involved in the very old practice of using ferrocyanide of potassium as an agent of conversion. It is well known that the application of this compound to heated iron instantaneously converts that portion of the metal that is brought in actual contact with it into steel; and that under a continued contact the entire mass, as well as merely the surface of any piece of iron, equally undergoes this transmutation. Thus, this agent is used to improve the quality of inferior steel; that is, more completely to effect the conversion of iron into steel; it is also sometimes resorted to to renew, or to restore, the steel quality of steel tools—for example, of chisels, the repeated heatings and forgings of which have decomposed the steel externally, or to a greater or less depth reconverted it into common iron. It is used more especially to case-harden iron, that is, to give to it an external coating of steel, or to improve soft steel by its more complete or perfect conversion superficially. This ferrocyanide of potassium is a *carbon* compound, containing, in its anhydrous form, no oxygen; and, doubtless, it would be on some theory of its carbon-giving agency, that its application (could we possibly trace the origin of it) to iron was first made. But besides carbon, it contains also iron, nitrogen and potassium. Its formula is, K_2 Fe Cy_3 (or 3 NC_2).

Now, the specific action of this re-agent, or the cause of its producing this singular effect—the instantaneous conversion, at the points of contact, of iron into steel—might *à priori*, be held to be due to one or other of the following kinds of reactions:—

1. To the reduction of some portion of the carbon of the re-agent, and its being taken up by the hot metal with the usual result of such a combination, as viewed on the old theory of what steel is.

2. To a deposition upon the surface of the hot metal of a thin film of the pure iron, combined in some peculiar proportion or manner with the pure carbon, both of which exist in this re-agent itself.

3. To some peculiar action of the potassium present in the re-agent; or,

4. To some peculiar action of the nitrogen of the re-agent, or of that element and its associated carbon existing there in the form of cyanogen.

For merely preliminary trials or indications, let there be selected some ready method of determining which of these elements or combination of them plays this part of conversion; and for this purpose, let there be taken as the test, the formation or the nonformation upon the surface of soft iron of a case-hardened surface, or of a superficial coating of steel as the result of an application to the iron of one or other of the following reagents—the relative hardness of the surface being determined by the file test, and after tempering by dipping the hot metal in water in the usual manner, and this, together with the colour test, that is, the development of the series of colours under different degrees of heat peculiar to steel, being taken as the test of its formation.

Let the kind of iron that is selected be the best and commercially the purest malleable iron, such as would be chosen for conversion into the best steel.

The manner in which the writer proceeded in these trials was as follows:—Little bars of this iron were made red hot in a porcelain tube, and then the re-agent was washed over or sprinkled upon its clean surface, or the gaseous or volatile matter (when such was used) was passed through the tube holding the red hot bars. When the charcoal experiment was made, freshly made and pulverized boxwood charcoal was selected; this made red hot to expel all adhering azotized or other gaseous matter; then quickly transferred to the tube, the rod of iron imbedded in it, and the two ends of the tube closed. When to this last arrangement atmospheric air was added, the ends of the tube, placed horizontally, were left open, and the air, by diffusion, or by a quiet interfusion, found its way into and within the body of the charcoal, and, of course, into contact with the heated iron.

It is needless to point out that this line of experimenting is calculated to obtain, and aims at obtaining, only very broad indications of re-actions and effects, for the iron used is only approximately and not absolutely pure.

But the indications of the special action of each re-agent on its application to the iron are so marked and distinctive, and develope themselves so broadly under the above system of testing, that this method of detecting the reactions, though not absolutely unqualified in its accuracy, is sufficiently tangible for its intended purpose, and lies within the reach of every one. It will be seen how in following up this investigation, for those comparatively rude methods there are substituted others aiming at greater precision, which will appear in a subsequent chapter. The temperature under which the following several re-agents were applied to the iron was that of a full red heat, or that usually employed in case-hardening, or in the cementation process of conversion. Let any experimentalist proceed in this manner to apply to heated iron the following special re-agents and he will find:—

1. That heated iron exposed to the action of pure carbon and kept out of reach of contact with any other element, is not converted into steel. A small rod of the malleable iron packed in boxwood charcoal in the closed porcelain tube, and kept at a full red heat for 12 hours, did not, after being tempered, show a hard steel surface, nor did it exhibit, under high and different degrees of heat, the play of colours peculiar to real steel. It still remained malleable iron.

2. But that when atmospheric air is admitted to such an arrangement in such quantity only as still to keep the carbon in excess, then, in the first instance, the surface of the iron, and, finally, (if the time of contact be long enough), the whole of the iron is converted into steel.

3. That the application to the iron of gaseous nitrogen does not produce steel.

4. That neither does the application of carbonic oxide give steel.

5. That the application to the iron of a hydro-carbon, (as when olefiant gas is passed through the tube, or when the red-hot rod is dipped into oil containing no nitrogen) does not produce steel.

6. But that the application of olefiant gas mixed with ammonia, or the application of gaseous cyanogen, produces steel, as does also the dipping of the hot metal into a nitrogenised oil or fat.

7. That the application of ferrocyanide of potassium (as has been so long known) gives steel.

8. That, equally with the ferrocyanide, does the application of the simple cyanide of potassium result in the production of steel; therefore, it is not to the iron contained in the ferrocyanide that the steel-making property of the latter salt is due.

9. That potash applied to the hot iron, or keeping the hot iron in contact with the vapour of potassium does not yield steel.

10. That with iron of the kind that has so far been referred to and used, (*i.e.*, commercially pure wrought iron, containing no material proportion of carbon), the application to it of ammonia, or of nitrate of ammonia, fails to produce steel.

11. But that the application of ammonia, or its muriate, to iron containing a considerable proportion of carbon, results in its conversion into steel.

These results tabulated, and the composition of the re-agents expressed in formulæ, will better exhibit the inevitable deductions to which they lead.

(1). $Fe + C$ (in excess), every other element excluded	Leaves iron.
(2). $Fe + C$ (in excess) + (atmospheric air)........................	Gives steel.
(3). $Fe + N$ (gaseous nitrogen).......	Leaves iron.
(4). $Fe + C\ O$ (gaseous carbonic oxide)...............................	Leaves iron.
(5). $Fe + H_4\ C_4$ (olefiant gas)	Leaves iron.
(6). $Fe + H_4\ C_4$ (in excess) + $N\ H_3$ (ammonia)	Gives steel.
(7). $Fe + N\ C_2$ (cyanogen)	Gives steel.
(8). $Fe + K_2, Fe\ Cy_3$ (ferrocyanide of potassium)	Gives steel.
(9). $Fe + K, Cy$ (cyanide of potassium)	Gives steel.
(10). $Fe + KO$ (potash)	Leaves iron.
(11). $Fe + K$ (potassium)	Leaves iron.
(12). $Fe + NH_3$ (ammonia)...............	Leaves iron.
(13). $Fe + NH_3\ Cl$ (sal ammoniac)	Leaves iron.
(14). $\frac{Fe}{95} + \frac{C}{5} + NH_3$ (ammonia).......	Gives steel.
(15). $\frac{Fe}{95} + \frac{C}{5} + NH_3$ (sal ammoniac)..	Gives steel.

Now, out of a consideration of these preliminary and merely guiding trials, besides the other deductions they lead to, as those have been already stated, there is made apparent one significant fact, namely, the invariable co-operation, so far as these trials extend, of both nitrogen and carbon in the production of steel; but these co-operating in some manner yet to be defined and ascertained. It still remains to be determined if this co-operation of nitrogen be a *necessity* in steel making; or if the apparent invariableness of its presence and co-operation will, on a more extended examination, be borne out by the evidence of every other process; and if so, is it that the nitrogen conjointly with the carbon, forms some combination with the iron and remains there; or, that the nitrogen acts merely as an intermediate agent, and that it still remains a chemical fact that steel is merely iron combined with carbon only, though nitrogen plays an essential part in effecting that combination?

IV.—*Other Evidences of Presumptive Co-operation.*

But whatsoever may be the functions in steelmaking, that are exercised by nitrogen—if its office be functional at all, and its presence be not a mere coincidence in every case—the fact of its invariable co-existence with carbon, whenever steel is produced, is incontrovertible.

We have it in the old ordinary cementation-boxes, which, filled with charcoal and the imbedded iron, are closed, but not hermetically sealed, and still sufficiently open to the inevitable permeation, through the excess of carbon, of atmospheric air, yielding, by its oxygen, carbonic oxide, and to the steel, nitrogen. We have it still more especially and obviously when, in this cementation process, there is superadded to the charcoal some horn, or leather shavings, or animal charcoal, along, sometimes, with an alkali—a very old but not a generally used modification. We have it when the iron for conversion is exposed in close vessels to the action of coal-gas, but in which coal gas, to a greater or less extent, there is always present either cyanogen or ammonia, or both. We have it also in all the multifarious expedients of the steelworkers and steel toolmakers, resorted to to give increased hardness to the metal—that is, to effect its more complete conversion into steel; as, when the filemaker coats his file, before tempering it with a composition of cow-dung or with pig-flour—two favourite specifics, and both highly azotised substances, which he thinks useful merely for protecting the sharp angles of his cuttings from the action of the fire, but which also act, in reality, in more completely steelifying his finished work. We have it in the use, in so many cases, of horn shavings, of horn dust, of leather shavings, and of other animal, and consequently, azotised matters of various kinds; in the use of other vegetable substances (besides that just mentioned) containing large proportions of gluten, and consequently of nitrogen; in the use of the ammoniacal salts, to say nothing of the prussiates, the recognition of the potency, and of the great value of which for steel making in bulk, as well as for merely hardening it superficially, as heretofore, is now becoming general.

We have a conspicuous instance of the effect of the presence of this element in a well-known fact, that whilst the dipping of the hot metal into olive oil fails, the use of beef suet (an azotised fat), succeeds in giving to the iron a coating of steel.

It was the presence (but, to him, the unconscious one) of this same element that gave to the celebrated expedient of Mr. Heath its chief potency, in improving the quality of inferior steel, and not solely to any purifying or alloying action (if any) of his manganese; for latterly Mr. Heath used *coal-tar*, placed in contact with the steel, to reduce his manganese oxide; and this coal-tar is a highly nitrogenised as well as a carbonised compound. In short, in whatever practice the various and continual trials of the steel artizan may result, in his searchings after the best hardening agents, (and he resorts to the most extraordinary things), that practice will be found invariably, when successful, to involve the employment of some material in which nitrogen is an essential element.

V.—*Some Evidences of Analysis as to the Real Composition of Steel.*

A review of the above facts and phenomena is provokingly suggestive that the existing theory of the composition of steel is a wrong one. And the first suspicion is that this nitrogen element does actually enter into and exist in that compound, and that not to errors in analysis, but to misconceptions when nitrogen was found in steel, or to the influence of pre-conceived notions, is to be attributed the fact of this element exercising any kind of agency in steel-making having hitherto been overlooked; or that its presence, when found, has either been disputed or attempted to be accounted for on other grounds than that of chemical combination.

The attention of the chemical world was first prominently called to the fact of the existence of nitrogen in iron and steel by Professor Schafhäutl, a translation of whose paper appears in the *Philosophical Magazine* for 1840. Now, about this period there had arisen some of those new methods in analysis for finding and determining the quantity of nitrogen that, added to subsequent discoveries in the same direction, have given so happy an impulse to analytical chemistry. The method of Dumas—of Schafhäutl himself—of Will and Warrentrap and of Lassigne, were about this time brought into notice, and Schafhäutl, without appearing to have in his mind any theory as to the part played by nitrogen in the composition of steel as distinguished from iron, but knowing that nitrogen was ever present in the manufacture of iron, would appear to have tried his hand at its analytical detection. His results are given with a broadness and an absence of specific details that suggested a repetition of them by the next investigator, Professor R. Marchand, whose essay will be found in the *Chemical Gazette* for 1850, the latter chemist applying, with considerable ingenuity, the resources of a still more advanced chemistry in refutation of some of the results of the former. To give a still greater zest to such investigations, it had just then been discovered by Wöhler that those beautiful copper-coloured cubic crystals, found in the slags of the blast furnaces, which we had been accustomed to call titanium, were none other than a mixture of a cyanide and of a nitruet of that metal—a fact suggestive enough that in iron too there might, not improbably, be discovered some analogous combinations with nitrogen. Schafhäutl gives as his results that malleable cast-iron contains 0·532 of nitrogen, close grained cast-iron 0·927, coarse grained cast-iron 0·740, white pig iron 1·200, and that in Beinhauer's razors there is 0·532 of nitrogen. Marchand asserts that these proportions are too high, but admits the invariable presence of nitrogen in cast-iron, and its equally invariable absence in malleable iron. Speaking of that method under which the existence of the nitrogen is proved by the formation of Prussian blue, he says that "with steel powder (as compared with cast-iron) it was still more striking, and with soft-iron it was never apparent." But it is to be observed that it was with cast-iron chiefly, and not with steel, that Marchand operated; still he detects in this cast-iron the invariable presence of nitrogen, and in pure iron its invariable absence. Neither of these chemists speculated as to the meaning or the effect of the presence of the nitrogen in steel; wherever in the exercise of their manipulatory skill it is found, the fact is left without comment or consideration. Had the comparisons been made with pure steel, as compared with pure iron, there can be no doubt that Marchand would have recognised those marked distinctions which it is the object of the writer to point out.

Now, suspecting less from such evidences or suggestions as these than from the facts to be observed on conversion, (such as that of the singular influence of cyanogen compounds,) the substantial and invariable existence of nitrogen in steel, the writer proceeded to arrive at that point as follows: The best malleable iron on the one hand, and by way of comparison with this, the same kind of iron fully converted by the usual process, were taken on trial; the steel was dissolved in very dilute and pure hydrochloric acid, and after many trials it was found best to place the bar of steel or iron in single voltaic arrangement with platinum, and to effect the solution in the cold with the usual precaution of expelling air from the water employed. In this way, slowly, the steel was dissolved, and the carbonaceous flocculent matter that was left collected, carefully dried, and analysed. The iron was treated in the same manner, and the comparatively very small proportion of carbonaceous residue given by it also examined. And these were compared with the residue obtained also from cast-iron. If the acid be strong, and heat be used, and the voltaic arrangement be not used, the results are very different. Gaseous nitrogen, in very minute quantity, is given off along with the hydrogen, some muriate of ammonia is formed in the solution, and but little nitrogen left in the residue.

Effecting the combustion of each of these residues by aid of the soda-lime process, in the usual manner, the following results were obtained:—1. The residue from the malleable iron contained no nitrogen whatever. 2. That from the cast-iron always showed the presence of nitrogen, but in very minute and in variable quantities; an average of results would seem to confirm the analysis of Marchand. 3. In the steel residue there was invariably detected a considerable quantity of nitrogen.

The analysis of this carbonaceous residue gave—$C = 0{\cdot}63$, $N = 0{\cdot}24$; impurities, $0{\cdot}13 = 100$. The direct analysis of this sample of steel, using the soda-lime process, gave in 100 parts of steel $C = 0{\cdot}68$, $N = 0{\cdot}19$; that is, every 100 parts of steel contained about $\frac{1}{5}$th per cent. of nitrogen associated with about three times its weight of carbon. The proportion of nitrogen in the residue was greater than in the steel itself,—a result proved afterwards to be due to the absorption of nitrogen or the formation of ammonia in the act of drying the residue. The direct analysis of the malleable iron gave no nitrogen whatever—that of the cast-iron only a trace. This steel contains therefore about $\frac{1}{5}$th per cent. of nitrogen, and by other trials good steel always gives about this quantity, but inferior steel much less. It is obvious that the residue is an azotised carbon, out of which fact arise some important considerations. But confining these, for the present, to the cases of the malleable iron and the steel, it would appear that the difference in chemical composition between these two is not less remarkable than the difference between their respective physical properties; but in what precise manner these two elements, carbon and nitrogen, produce these differences, or the form in which they exist together in the steel, we can only as yet conjecture theoretically.

VI.—*Some Synthetical Evidences.*

When malleable iron is placed in a crucible along with some of this azotised carbon, the intractability as to fusion of the metal is soon overcome, and it melts at a white heat, and cast-steel is the product.

When there is prepared a mixed precipitate of oxide of iron, and of oxide of manganese, and this is reduced to the metallic state by passing over it, at a high temperature, hydrogen gas—that is, in the usual manner, made into spongy iron, plus manganese; this, placed in a covered crucible, readily melts and gives an exceedingly hard alloy, but one that does not possess all the properties of real steel.

But when with spongy iron itself there is mixed some ferrocyanide of manganese, and then it is exposed to a full heat in a covered crucible, the button that is produced has all the properties of steel.

The same follows on substituting ferrocyanide of iron, or any of the anhydrous alkaline ferrocyanides.

The addition in the hot and closed crucible of bitartrate of potash to the pure iron does not give steel, but the addition of the double salt of tartrate of potash and ammonia (which is a kind of improvised mode of making cyanogen) gives a button of steel.

Another series of instructive facts, in proof and in illustration of these reactions, is obtained by the use of the voltaic battery to heat the iron whilst it is exposed to the action of an atmosphere of certain gaseous or volatile matters:—

Let the malleable iron, upon which to operate for conversion, or proof of non-conversion, be drawn into rods of about ¼th of an inch in diameter, (at each end), but drawn out between these—that is, in the middle, into a thin wire, tapering gradually towards the thin ends. Fix such a rod in the centre of a glass tube or globe, so shaped and contrived that gaseous matters can be passed into and through it; connect the obtruding thick ends of the rod with the opposite poles of a voltaic battery—powerful enough in its action to raise the thinner portion of the rod to a red or white heat *ad libitum*, whilst the thicker ends never become so hot as to interfere with the means used to keep them in their position. Fill the tube successively with the following gases and watch the results:—

Gaseous cyanogen, after a few hours, gives rise to the formation of steel in those portions of the rod that have been fully heated, and this is accompanied by a deposition of carbon upon the face of the metal.

Gaseous ammonia *per se* does not give steel, but produces a curious disintegration of the face of the hottest portion of the rod.

Olefiant gas *per se* does not give steel, but gives a deposition of carbon on the hotter portions of the wire. Olefiant gas mixed with ammonia or with nitrogen does give steel, and so on.

But without further multiplying examples, (and this mode of experimenting admits of a great variety), and without attempting at this time to inquire into some of the complicated phenomena they present, one fact is ever apparent, namely, the invariable co-operation of both nitrogen and carbon wherever the result is the production of steel.

VII.—*Deductive Inferences and Theories.*

In thus briefly, because of the necessary limitation of time, gathering together these facts and evidences, and in submitting them to the consideration of this audience, I am perfectly aware, on the one hand, of the many imperfections of my own work, and, on the other, of the great skill as analysts, experimenters, and theoretical reasoners, of very many now present, and of many others under whose scrutiny this paper will afterwards fall. But my object is to submit, not to decide; and whilst giving my own views and deductions, to inquire of these better judges what would be their interpretation. Should such interpretation be altogether different from the writer's, he will rejoice to dismiss his own, provided only that this other be the true one. But as to this simple question of the nitrogen element, how much yet remains to be done! Out of the multiplicity of reactions, and the line of experimenting here indicated, how wide a field is there yet to be traversed by the experimentalist; and how much is it to be regretted that those magnates, the iron and steel masters of this country, do not resolve themselves into a species of scientific congress, and casting aside for a while their trade jealousies, organize some mode of settling all these vexed but most important questions.

The conclusions that to the writer appear to be be warranted by the previous evidences are:—

That the substances whose application to pure iron convert it into steel, all contain nitrogen and carbon, or nitrogen has access to the iron during the operation.

That carbon alone added or applied to pure iron does not convert it into steel.

That nitrogen alone so added or applied does not produce steel; but that

It is essential that both nitrogen and carbon should be present, and that no case can be adduced of conversion in which both these elements are not present and in contact with the iron.

That nitrogen as well as carbon exists substantially in steel after its conversion; and such presence is the real cause of the distinctive physical properties of steel and of iron, in which latter these elements do not exist.

That presumptively, but not demonstratively, the form of combination is not that of cyanogen (though that compound plays so important a part in conversion), but is that of a triple alloy of iron, carbon, and nitrogen.

That experimental research is yet required to determine the relative proportions of the elements when their union gives pure steel.

What in the chemical history of nitrogen is there that is incompatible with its substantial existence in steel—in some form analogous to other combinations we know it to assume under similar conditions with other metals? It is under a temperature as high as that needed to melt steel that it combines with carbon to form cyanogen, and then with potassium to form cyanide of potassium, and under this combination it is permanent, so long as it is kept out of contact with decomposing agents, as oxygen and the elements of water, &c.

In the presence of our atmosphere, with its affluence in nitrogen, why should we ever ascribe to that element some merely negative attributes, or properties serving only to control or modify the more vivid action of some other element? Why dwell only on its azotic action, or on its assumed mere modifying action among the phenomena of animal or of vegetable life? An element existing everywhere, touching everything, penetrating, permeating, and by diffusion intermingling itself with every gaseous body it comes in contact with, might be supposed *à priori* to exercise other functions (and many) besides the merely negative ones usually assigned to it. And among other speculations that naturally arise out of these questions, is it quite impossible that the play of colours peculiar to heated steel, the assumption for example of the pure blue, and the purple, may not in reality be due to some phase of development of some of the forms of ferrocyanide of iron?

We possess other evidence of the use of nitrogen from another and unexpected quarter: it is on record as a practice of the Indian "Wootz" steelmaker that, along with his iron or imperfect steel in his melting crucible he places as his carbon-giving material the wood of the *Cassia auriculata*, and covers the whole with the leaves of the *Convolvulus laurifolia*, both vegetable productions rich in azotised matters. These placed in his closed crucible will give an azotised carbon in contact with the metal. And what may have been the origin of this far back practice of the East—this, to us, apparently empirical handicraft of some Indian artificer?

Has it originally been the result of some mere accident or of some induction or deduction—or is it a relic of some state of civilization and of science superior to those of the West? The Sheffield artizan seeks, even up to the present day, that which the Indian artificer had found out ages ago.

VIII.—*Manufacturing Appliances and Progress.*

But howsoever all this may be, whether the nitrogen exist as an essential constituent in steel, or its office be one of agency only,—the practical applications for manufacturing purposes that flow out of the above collection of facts, are in no way affected by the tenability or the contrary of any theory of combination. The fact of the important part in the conversion of iron into steel that is played by nitrogen and carbon conjoined, and particularly when in the form of cyanogen compounds, is incontestible, howsoever may be explained their mode of action. A movement in this direction, for manufacturing steel, has recently sprung up in several quarters, but principally among Continental and American inventors, who, in various ways, apply ferrocyanide of potassium, and mixtures of that with other matters, for manufacturing steel; showing that the *effects* and the value of these reactions are beginning to be recognised, though their precise mode of action is, in every instance, given differently from that here advanced. It is still the carbon only of these compounds that they seek for, and through whose combination alone they expect the conversion to be effected. The application for forming steel superficially, of prussiate of potash is, of course, very old; and it was in 1845 that the writer first applied gaseous cyanogen and volatile compounds of cyanogen, or matter containing their elements, in order to convert iron into steel, a method which in the year 1846 appeared publicly.

It is the experience of the writer, in his examinations of iron that is deficient in malleability, that this deficiency is due as well, and even more frequently, to the presence in such iron of unreduced oxide disseminated throughout the mass, as to the presence and action of sulphur, phosphorus, and other matters to which this deficiency is most generally attributed. This fact seems also to have attracted the attention of Mr. Bessemer, who alludes to it in one of his recent specifications. Now, the carbon-reducing power in metallurgic operations of alkaline cyanogen compounds is well known, and hence is suggested the possibility of employing them as well to remove from impure iron the sulphur, phosphorus, and silicium, so as to effect the complete reduction to the metallic state of any oxide of iron disseminated through the ores. But these alkaline cyanogen compounds, ferrocyanide of potassium for example, when added to molten impure iron, whilst exercising extraordinary purifying effects, leave the metal finally in the condition of steel. Here, then, is another problem, how to take advantage of these peculiar reactions, in order to produce, *ad libitum*, either steel or malleable iron—in other words, how best, after steel is produced, to effect its reconversion into iron.

It is impossible, within the limits of this paper, fully to discuss these reactions, or even such, for example, as those between that admirable converting agent, the ferrocyanide of manganese and iron, or those with iron containing a large quantity of carbon when such iron is converted into steel, on the application to it of muriate of ammonia.

It will be distinctly understood that the facts and reactions given by the writer have not yet been extended in manufacturing operations, but they are more than merely experimental.

The value of combinations of carbon and nitrogen in steel-making being acknowledged, then, of all such combinations or of elements containing these, it is undoubtedly to the use of the cyanogen compounds that we should resort for all manufacturing purposes; and the time seems not very far distant when these compounds will become some of the most readily obtained and cheapest of chemically-manufactured products. It is some years ago now that Mr. Lewis Thompson pointed out how these could be had through the nitrogen of the atmosphere, and thus gave the germ of a branch of manufacture that will grow into vast importance; and for the promulgation of which the world is indebted to this Society.*

The operations of the blast furnace suggest methods for the production of those compounds that are of the highest practical value. There are at play here all the elements for the production of cyanogen, of certain cyanides, and thence of other compounds, and the requisite conditions can be superadded for securing these for commercial purposes. That cyanogen was formed in certain zones of the furnace was proved by Bunsen and Playfair. Dr. Clark, of Aberdeen, many years ago, examined a saline product that was found to ooze out of the tuyere holes of a blast furnace in Scotland, and discovered it to be cyanide of potassium. In several places on the Continent, as at Mariazoll, in Styria, for example, we are told by Gmelin, that this product is so abundant as to be sold commercially for galvanic gilding purposes. It is, of course, the product of cyanogen, when combined with the accumulated proportion of potash contained in the fluxing limestone. But why not specially add the alkaline element, and combine in the furnace simultaneously the peculiar reducing and converting actions of these compounds with their special manufacture for other and equally valuable industrial applications of them that are springing up? And this is undoubtedly one of the most important of the directions that the iron manufacture of this country will in future be found to take.

The writer has not the honour of a personal acquaintance with Mr. Bessemer, but he cannot close this paper without, on his own account, expressing his sense of the deep obligations he considers the iron world owe to that gentleman, were it merely for the practical development of that beautiful fact, the vivid reaction between atmospheric air and molten iron of which so much use can and should be made. This obligation is a great one, to say nothing of that singular impulse, in all directions, in this manufacture, that his discovery has given rise to. With that species of hypercriticism which would seek to underrate this discovery, because a stream of air impinging upon strongly-heated iron had always been known to give a vivid combustion of the metal, the writer has no sympathy. Such after-thinkers will be invariably found never to have done anything themselves —never to have given to the world one single new fact, or to have thrown a spark of light on the meaning of any collection of facts; otherwise, they would have some sympathy for the pains-taking and the ill-requited labour that, too frequently, are the only concomitants of such achievements.

For all and every one of the busy workers now, in the many directions, devoting their efforts for the improvement of steel and iron manufactures, there is ample room and occupation. The work is indeed but scarce begun; its progress slow, but the beneficial issues inevitable. England above all has a mighty stake in these developments, and in their co-operation we can well afford to welcome the arrival of other labourers in the common field, whether they come from France, from Belgium, from Prussia, or from Austria, or they may be some of our ambitious and stalwart rivals from across the Atlantic.

DISCUSSION.

Mr. DAVID MUSHET called attention to some specimens of iron and steel, particularly to a short bar, which exhibited fibrous structure at one end, whilst it was "cold short" at the other.

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* Mr. Thompson's paper appears in the "Transactions of the Society of Arts" for the year 1837.

Mr. F. A. **Abel** (of Woolwich Arsenal) believed he should be representing the opinions of the chemists who had with him listened to the paper of Mr. Binks, in expressing his admiration of the ingenuity displayed in the author's train of reasoning and of experiment, and in stating that great thanks were due to Mr. Binks for having opened up so important a question as the influence excited by other elements than carbon upon the constitution of steel. Mr. Binks had alluded to the experiments made some years ago by Schafhäutl and by Marchand, by which the existence of nitrogen in specimens of cast-iron and steel had been pointed out; but to him the credit was due of first entering upon a consideration of the functions which that element might exercise in cast-iron and steel. The arguments and facts upon which Mr. Binks based the assumption that nitrogen was an essential element in steel, and that, indeed, steel could only be produced by the union of iron with nitrogen in addition to carbon, were entitled to the most deliberate consideration and to the closest investigation; it would be presumptuous, without such investigation, to enter upon their discussion, or to challenge the construction placed by Mr. Binks upon various circumstances alluded to by him, as, for example, the influence exerted by the small quantity of atmospheric air which finds its way into the cementation chest, upon the production of steel by the agency of charcoal in the ordinary manner. Assuming, however, that steel cannot be obtained without the entrance of a certain quantity of nitrogen into the constitution of the metal, he (Mr. Abel) was curious to learn in what manner Mr. Binks accounted for the production of steel by the de-carbonisation of finely divided cast, or partially refined iron in closed crucibles, by such means as those proposed by Captain Uchatius, or by fusing together, in a closed crucible, the proper proportions of cast and wrought iron, the former containing only a trace of nitrogen, and the latter none of that element. Assuming, for an instant, the possibility of an assimilation of nitrogen from the air by fused cast iron, it would even then be difficult to conceive that the requisite amount of that element was accidentally supplied to the contents of the crucible. With reference to the proportion of nitrogen which Mr. Binks had found by analysis to exist in steel, Mr. Abel would venture to observe that it appeared to exceed considerably the quantity which a perusal of M. Marchand's publication "On the Determination of Nitrogen in Iron" would lead the reader to suppose as actually existing in cast-iron and steel. It would be seen from that paper that many of the results obtained were principally due to the influence exerted by the agents necessarily employed upon the nitrogen of the atmotphere, and it was well known to all who had devoted any attention to the determination of small quantities of nitrogen, how very difficult it was so to perfect the analytical arrangements and details as to ensure the exclusion of errors, resulting from the tendency of the atmosphere to insinuate itself, errors fatal to the accuracy of the process. It would have been desirable that some description of the precautions adopted by Mr. Binks to exclude such errors had been entered into in a paper of such interest and importance, in order to ensure for the results given by him the confidence to which, doubtless, they were entitled. Up to the present time, the somewhat fabulous results of M. Schafhäutl, and the subsequent experiments of Mr. Marchand had led chemists to the conclusion that the existence of appreciable quantities of nitrogen in different varieties of iron was still somewhat uncertain; it was much to be wished that the very interesting views which had been advanced that evening would lead authorities eminent in analysis to control the results arrived at by Mr. Binks and former experimenters. Mr. Binks had pointed out, in a most forcible manner, the fact that from the method of manufacture of the Indian "Wootz" to the most recently patented processes for the production of steel, nitrogen was invariably involved, and apparently as an important element; he had also shown that in very many cases this nitrogen either pre-existed as cyanogen, or entered into such combination with carbon before being placed in a position to exert its influence upon iron. The effect of ferrocyanide of potassium in case-hardening iron had been specially examined into; and, as far as the experiments of Mr. Binks proceeded, a case was apparently made out in favour of the influence of nitrogen. The particular effect alluded to of the ferrocyanide of potassium had ever been a chemical problem, and its complete solution by Mr. Binks would be received with the greatest interest. It must be borne in mind, at the same time, that until the invariable association of nitrogen with carbon in steel had been fully proved, the favour bestowed upon other methods of explaining the action above alluded to would scarcely be transferred to the view suggested by Mr. Binks. Until proof positive was adduced to the contrary, it might, for example, still be considered a simple method of explaining the case-hardening effect of the ferrocyanide of potassium, to believe that this compound was so decomposed by contact with the heated metal as to furnish a film of carbide of iron upon the surface of the latter, and that by a simple reaction between this carbide and the proximate particles of wrought iron, steel was produced. To determine this point required but a few experiments; the above explanation was alluded to in order to show how wide a field had been opened by Mr. Binks, and how necessary it was that the most careful experimental research should be brought to bear on all sides of the question. It must be admitted that some great influence appeared to be exerted by the presence of nitrogen in some form or other in the production of steel, and our knowledge of the reactions in the blast furnace would alone lead us to believe that, indirectly, nitrogen was, with reference to the reduction of iron, a very important agent; but if the suggestion thrown out by Mr. Binks, that steel be an alloy of iron with carbon and nitrogen, be adopted, the latter element must be viewed in a new light, for it must have become endowed with very active properties, if so small a quantity as even Mr. Binks showed to exist in steel, could exert so important an influence upon the character of iron; an influence far surpassing that exerted upon iron by similar proportions of elements remarkable for their chemical activity, which were constantly found associated with that metal. A complete elaboration of the views brought forward by Mr. Binks would not therefore fail to be replete with interest, and amply to repay the labours of the scientific, and doubtless also, of the practical investigator.

Mr. T. M. **Gladstone** said he had listened with much interest to the paper read by Mr. Binks, and had no doubt that the results of that gentleman's experiments were to be fully relied on, but the manufacture of steel or of iron, or indeed of anything else, was a question of pounds shillings and pence; while in the laboratory there were very often beautiful analyses and effects produced, with which it was desirable to be acquainted, yet that, after all, the great element of economy of production must be recognised. Mr. Binks had stated that nitrogen was an essential element in the conversion of iron into steel. He concurred completely in that view, and in the ordinary process of the conversion of iron into steel the materials used by the manufacturer always contained the nitrogenous element. He was sure that in Sheffield and in other parts of the country the manufacturers themselves were desirous to have the very best article produced in the very best way, and they had the best means of experimenting. He thought that, if Mr. Binks had omitted from his paper the part that referred to the jealousies of manufacturers, he would have done more justice to his own cause. Matters of this description required the deepest and most searching examination by men who, from their long experience, were best able to appreciate the nice distinctions of the manufacture. In cast iron, when "chilled," there was a large quantity of earthy substance; the result of this process was to produce a surface on the metal which almost approached the character of steel itself. He wished that Mr. Binks had not introduced Mr. Bessemer's process into his observations, because he (Mr. Gladstone) was of opinion that Mr. Bessemer had not advanced one step in the improvement of the manufacture of iron.

Mr. Braithwaite said, with regard to the manufacture of steel, it was necessary to take into consideration the question of how the iron employed could best be refined, and when they were told that to make good steel there must be 99 per cent of iron and 1 of carbon, the question was how the iron could be so refined as to produce it. There was no difficulty in refining either gold or silver, but then those articles commercially were of such enormous values as compared with iron, that any expense could be gone to in doing so.

Mr. Varley said, that when experiments were being made for ascertaining the composition of the diamond, a portion of iron was hermetically enclosed with a diamond in a gold crucible, and after being exposed to heat, the iron was found to have been converted into steel. In this case he believed no nitrogen was present.

Mr. Longsdon said, that in the absence of Mr. Bessemer, he would observe, that the question gone into by Mr. Binks, appeared to him to be a pure matter of detail, and was a subject which had already been mooted by the most able chemists.

Mr. Alfred Watney said he had had some experience in the processes of iron making, and very much doubted if chemistry would ever be of much assistance in improving the manufacture of either iron or steel. Chemistry had done great good in many manufacturing operations, but he thought it had had less success in dealing with metals than with anything else. As regarded copper, the operations of reducing it from the ore were very tedious. An immense number of patents had been taken out with the view of simplifying them, but the manufacturers had all gone back to the original process of remelting and calcining over and over again, until they produced a pure copper. He believed that the manufacture of steel would always be best accomplished by adopting those processes which had hitherto proved successful, and any attempt to make it direct from ores which contained many foreign matters would fail.

Mr. Stedall said that with reference to the difficulty of procuring good qualities of iron for steel making, a short time since he received a communication that a large quantity of foreign iron had been wrecked upon the coast and was for sale. He had been induced to purchase some of it, believing from the nature of the brands that it was foreign iron, but he learnt from a Sheffield manufacturer that there were thousands of tons of iron made in this country with similar brands, which represented it to be Swedish, although it was not so.

Mr. Archibald, F.R.S., drew attention to some specimens of Acadian iron and steel, with cutlery manufactured therefrom, and stated that the production was increasing, and he had no doubt that ultimately there would be a very considerable and extensive supply.

Mr. Fletcher said that he thought now that a person who was neither a chemist nor a manufacturer might fairly call the attention of the meeting to the very important propositions which had been so ably submitted to the consideration of the Society by the author of the paper. All that Mr. Binks proposed to establish was, that instead of carbon being the only element necessary to convert iron into steel, there must also be a portion of nitrogen. It was no contradiction to this assertion to say that they were bound to add another element and call it cheapness. Mr. Binks simply laid before them a great law; he presented a new great metallurgical fact, that an element which had hitherto played an important part in the manufacture of steel, had nevertheless not been detected. While admitting this fact and this law, the question was, did Mr. Binks see his way to the use of that law in such a manner as commercially to benefit the country. He (Mr. Fletcher) believed that there was no great chemical fact without its great commercial advantage; that, if they once announced to a number of Englishmen a great chemical fact as a matter of certainty, it would be turned to good account. The argument amounted to this—that, whereas they were for certain qualities of iron suited for the best steel absolutely dependent upon foreign countries, they could, in the event of the success of Mr. Binks's plan, rely upon the productions of their own.

Mr. Pearsall was inclined to submit the opinion, that the wandering away from the discussion of the clearly expressed objects of the paper, and the silence or the absence of those persons whose interests were involved, became a source of compliment to Mr. Binks, especially as no steelworker had risen to disprove the views advanced or to prove any opposite view. Even the remarks of Mr. Abel were sufficiently significant and complimentary, for while he submitted that critical verification might be required for the full adoption of these views, yet this also implied that other views and rule of thumb practices should receive more vigorous examination. A practical statement had been made to the effect, that silver and gold were so valuable, that their refining could be better attended to than iron; now, unless he was much mistaken, it would be found that there were forms of iron and steel which, weight for weight, were more valuable than silver, gold, or any metal. He did not allude to the value of the Berlin fine filagree iron-castings, but to steel, in the form of watch-springs, and he thought Babbage, in the "Economy of Manufactures," recorded the particulars. This led him to the very question of the paper, and the influence of true theory to produce right practice. What were the positions of the poor man and the practical man, who had been induced by practice and by chemical books and teachers, to believe that iron and carbon constituted steel; and that evening Mr. Binks had distinctly detailed the experimental grounds on which he denied this statement, and now put forward the view that iron, nitrogen, and carbon, formed steel. If Mr. Binks's view were correct, they had a key to explain doubtful results and even failures, loss of character and trade. He might also add, that the arguments to be drawn from the constant presence of air in all steel-making were not to be overlooked, especially as facts were well known which showed strange affinities between metals and gases at different temperatures. It could not be expected that views so original and so clearly expressed, would be allowed to pass unheeded; indeed a tone of respect had been evinced by this meeting, that he thought would be felt to be satisfactory to Mr. Binks, and this might be regarded as the commencement of that due consideration of the question which would reflect credit upon the Society and benefit to the country, by calling for critical attention to the true theory and right practice of the conversion of iron into steel.

The Chairman said, he was quite sure that every person present must be greatly indebted to Mr. Binks for introducing so very important and interesting a subject to their notice. He did not know whether Mr. Binks was at all acquainted with the researches of a French gentleman, of the name of Chenot, who, some years ago, produced steel direct from the ore. He converted the ore into a spongy mass, which, after being subjected to the action of the furnace, was plunged into oil, and then compressed into an ingot. Mr. Krupp had also done much in the manufacture of steel, in Prussia. He (the Chairman) should have liked to have heard the result. Mr. Binks had proved, as far as he (the Chairman) had any knowledge of the manufacture of steel, that that article could not be made with carbon alone, and he believed that the manufacturers in this country would take advantage of the theory just propounded to them. Under these circumstances he had very great pleasure in proposing a vote of thanks to Mr. Binks for his able paper.

A vote of thanks was then passed to Mr. Binks.

The Secretary announced that this was the last Ordinary Meeting of the Session, and that the Annual General Meeting of the Society would, in accordance with the bye-laws, be held on Wednesday, the 24th of June, at 4 p.m.

Home Correspondence.

BLACK-BONED FOWLS.

Sir,—I am surprised that any "Naturalist" should express disbelief as to the black colour of the bones of the Honduras fowl, referred to in your number of the 15th inst. Mr. Temple's statement may be fully relied on, and it is corroborated by the late celebrated Professor Blumenbach, who, in his "Comparative Anatomy," states that in some varieties of the common fowl the bones approach to a black colour. The same has been noticed by Abulfazel, the Vizier of Akber the Great, of the fowls at Indore and Neermul in Berar (see "Ayeen Akbery," vol. 2, p. 72); and Niehbuhr has affirmed the same of the fowls at Persepolis ("Travels," vol. 2).

If your readers will refer to the article "Birds," in Rees's Cyclopædia, written, I believe, by the late Professor Macartney, they will find that the question of colour was considered by John Hunter, and that he discovered it to be resident in the periosteum. The colour of the bones in different animals varies exceedingly; though generally white, there are yet many shades and gradations, probably in most instances influenced by the food upon which the animals are fed. The bones of the garpike (*esox belone*) are said to be of a green colour.

I hope Mr. Temple will fulfil his promise to introduce the black-boned fowl of Honduras into this country, as, from all the accounts given, it is most excellent food.

I am, &c.,
T. J. PETTIGREW.

16, Onslow-crescent, Brompton, May 18, 1857.

THAMES EMBANKMENT.

Sir,—When good coals can be obtained in London at 17s. the ton, 1s. 3d. a ton more or less is a considerable addition to their price. It was this that gave rise to my proposal about 15 years ago, to the Commissioners for the Improvement of the Metropolis, by which the embankment of the Thames might be rendered self-supporting, and another objection to Mr. Page's plan then under consideration might also be obviated. My suggestion was to construct warehouses in the lower part of the embankment, for inflammable stores, so that in the event of fires, every portion of them might be submerged, even at low-water. Cellars can be rendered perfectly dry by proper ventilation, as was evident in those over the reservoir in Portsmouth Dockyard, which were used for seasoning block shells. The other objection attempted to be removed, was the proposed abandonment of the existing wharves, from which a great revenue is drawn. My plan was to keep up the water behind the embankment, so that the wharves could be available at all times. In the upper part of the embankment, shops were designed, chiefly for refreshments, which being above high-water, would be a delightful situation. These streets would be on a level with the Strand, Fleet-street, &c. This is not my design, but that of my late husband, who, early in this century, was requested by the Metropolitan Commissioners to favour them with his ideas, and sent them a plan, in connection with which his dredging apparatus, then constructing for Portsmouth harbour, would doubtless have been used in the levelling for the embankment. He also proposed his mode of laying foundations under water, as being the most economical. About 200 feet were thus constructed at Sheerness, between 40 and 50 years ago, and have stood the raging sea so prevalent at that port.

I am, &c.,
M. S. BENTHAM.

26, Wilton-place, May 9th.

Proceedings of Institutions.

Haley Hill Working Men's College.—On Thursday evening the 16th ult., the first annual distribution of medals and prizes to the students of the above Institution took place in the Odd Fellows' Hall, Halifax, in the presence of a large assembly. Edward Akroyd, Esq., M.P., occupied the chair. Among the gentlemen present were the Hon. and Very Rev. the Dean of Ripon; the Ven. Archdeacon Musgrave, D.D.; Dr. Burnet, vicar of Bradford; the Rev. S. Holmes, vicar of Huddersfield; J. Whitworth, Esq., mayor of Halifax; James Stansfeld, Esq., county court judge; A. Redgrave, Esq., H. M. inspector of factories; the Rev. F. Watkins, H. M. inspector of schools; Thomas Bazley, Esq., President of the Manchester Chamber of Commerce; John Gott, Esq., of Leeds; G. S. Beecroft, Esq., Kirkstall Forge, Leeds; John Waterhouse, Esq., W. H. Rawson, jun., Esq., J. Abbott, Esq., T. Milne, Esq., M. Stocks, Esq., E. N. Alexander, Esq., G. Beaumont, Esq., T. Rawson, Esq., Col. Orange, John Haigh, Esq., of Huddersfield; — Frank, Esq., Bradford; Dr. Garlick, Dr. W. Alexander, Dr. Paley, the Rev. T. H. Hall, the Rev. C. R. Holmes, the Rev. J. H. Warneford, the Rev. W. Gilmor, the Rev. D. Bellamy, the Rev. G. Kinnear, the Rev. J. Hope, the Rev. J. C. Hyatt, the Rev. J. Walshaw, the Rev. Mr. Hughes, W. Craven, Esq., R. Carter, Esq., L. Gardner, Esq., J. W. Child, Esq., J. H. Franklin, Esq., and J. E. Norris, Esq. Nearly all the front seats were occupied by ladies. The Rev. R. C. Holmes read the report, which states that a year has passed since the opening of the Working-man's College at Halifax. It was established with a view of affording to the working classes the means of self-improvement, and to engraft upon the present factory system a course of education to be continued from the age of 13 years, at which it now closes, to manhood. The classes meet every evening, except Saturday and Sunday, from seven to nine o'clock. Connected with the institution is the working-man's lending library, containing about 4,000 volumes; also a news-room. There is also a recreation ground, with a gymnasium and a bowling green, and other appliances for out-door exercises. The committee endeavour to persuade the students to take up one subject, or not more than two, during any one term, and desire them especially to study those subjects which bear on their particular trades. The following classes have been in operation during the year:—Senior Division.—1. Arithmetic and Higher Mathematics.—Four classes, containing 64 students.—2. English Grammar and Composition.—Three classes, containing 73 students.—3. History and Geography.—Two classes, containing 42 students.—4. Drawing.—One class, containing 20 students.—5. Chemistry and Natural Philosophy—Eleven students.—6. French—Ten students. Junior Division.—1. Arithmetic—Three classes, containing 76 students.—2. English Grammar—Three classes, containing 70 students.—3. History and Geography.—Two classes, containing 38 students.—4. Drawing—One class, containing 18 students.—5. Chemistry—One class, containing 8 students.—6. French—One class, containing 10 students. In addition to the regular class instruction, lectures have been delivered to the students during the year on the following subjects:—Electricity, Galvanism, Electro-Magnetism, and Pneumatics; four lectures by Mr. Richardson. "Its nobbut" and "Niver heed," by Dr. Baker. "Electro-Magnetism," by Dr. Paley. "Providential arrangements for the lower creation during winter," by Rev. Dr. Burnet. "Literature and Science," by Dr. Hook. "Geology," by R. Carter, Esq. These lectures were all well attended. The Institution has been in connexion with the Society of Arts from its commencement, and several students will go to Huddersfield to compete for certificates at the examination of the Society of Arts there. From the commencement of the institution there has existed a separate branch for young women. The classes meet on three evenings each week—one of which is specially set apart for needlework, &c. There are at present 165 young women in regular attendance—of these only about 50 have received instruction in day schools. The very meagre amount of education the rest have had before joining the College has been obtained at Sunday schools. Of writing and arithmetic, the greater portion knew little or nothing when first they joined the College. The report of the examiners of the college was then read, and they express their satisfaction at the evidences of intelligence and interest in the work which the results of the examinations show. The examiners were the Rev. A. Barry, head master of the Leeds Grammar School, and the Rev. J. H. Gooch, head master of Heath Grammar School. The distribution of prizes then took place, consisting of medals and certificates. The meeting was afterwards addressed by the chairman and the following gentlemen:—The Hon. and Very Rev. the Dean of Ripon, Alexander Redgrave, Esq., inspector of factories; the Ven. Archdeacon Musgrave, Thomas Bazley, Esq., Dr. Burnet, vicar of Bradford; James Hole, Esq., of the Yorkshire Union; Mr. Crossley, Mr. Michael Stocks, and Mr. John Gott. A vote of thanks having been passed to the chairman, the meeting separated.

PARLIAMENTARY REPORTS.

SESSIONAL PRINTED PAPERS.

PAR. NO.

Delivered on May 14.

11. Mercantile Marine Fund—Account.
14. Committee of Selection—2nd Report.
16. Suspended Canonries—Return.
17. Poor Relief (Ireland)—Return.
20. Malt—Account.
22. Draftsment of Parliamentary Bills—Return.
23. Railways—Return.
24. British Spirits—Account.
8. Bills—Chatham Lands, &c.
9. Portland Harbour.
5. ——— General Board of Health (delivered on 13th May).

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128. Savings' Banks—Return.

Delivered on May 15.

18. Spirits—Returns.
27. Reviews at Spithead and Aldershot—Return.
28. Leitrim Election—Correspondence.
29. Railway and Canal Bills—1st Report of General Committee.
30. Navy Estimates—Abstract of.
13. Superannuation (Public Offices)—Account.
7. Bills—Ecclesiastical Corporations.
11. ——— Property Qualification.
12. ——— Aggravated Assaults.
15. ——— Court of Chancery (Ireland).
16. ——— Grand Juries (Ireland).

Delivered on May 16 *and* 18.

19. Hops—Account.
21. Valuation (Ireland)—Returns.
25. Spirits and Malt—Return.
3. Parochial Elections—Return.
32. Committee of Selection—3rd Report.
13. Bills—Savings' Banks.
18. ——— Ministers' Money (Ireland).
21. ——— Burial Acts Amendment.
10. ——— Sale of Beer, &c.
17. ——— Medical Profession.
20. ——— Medical Profession (No. 3).
6. Bills—Bankruptcy and Insolvency (Ireland).

Decimal Coinage—Preliminary Report of the Commissioners.
Loan Fund Board of Ireland—19th Report.

Delivered on May 19.

26. Local Acts, Admiralty Reports—1, Birkenhead Docks (Construction); 2, Wearmouth Bridge, Ferries, and Approaches; 3, Ely Tidal Harbour and Railway; 4, Great Yarmouth and Britannia Pier; 5, West Somerset Railway; 6, West Somerset Mineral Railway; 7, 8, Watchet Harbour—Watchet Harbour Trust; 9, Tilbury, Maldon, and Colchester Railway; 10, Newry, Warrenpoint, and Rostrevor Railway; 11, Midland Great Western Railway of Ireland (Sligo Extension); 12, North Level Drainage; 13, Sunken Vessels Recovery; 14, Waterford and Tramore Railway; 15, Herne Bay and Faversham Railway; 16, Fownhope and Holme Lacy Bridge; 17, Swansea Harbour Trust and Swansea Dock; 18, Sittingbourne and Sheerness Railway; 19, 20. Tweed Fisheries—Tweed River Fisheries; 21, Dartmouth and Torbay Railway; 22, Norwich and Spalding Railway; 23, Shropshire Union Railway and Canal; 24, Atlantic Telegraph; 25, Bristol, South Wales, and Southampton Union Railway; 26, Elie Harbour; 27, Blythe and Tyne Railway; 28, Richmond and Kew Extension.

Scottish Lunacy Commission—Report.

FIRST SESSION, 1857.

126. Divisions of the House of Commons—General Index.

Delivered on May 20.

15. Benefices—Return.
19. Bill—Married Women.

Scottish Lunacy Commission—Appendix to the Report.

SESSION 1856.

406. Foreign Military Education—Report.

Delivered on May 21.

42. Committee of Selection—4th Report.
14. Bills—Election Expenses.
24. ——— Chatham Lands, &c. (as amended by the Select Committee.)

Delivered on May 22.

44. Railway and Canal Bills—2nd Report from Committee.
37. Army Estimates.
26. Local Acts, Admiralty Reports—29, Southampton, Bristol, and South Wales Railway; 30, Tyne Improvement; 31, British and Irish Grand Junction Railway; 32, Backwater Bridge and Roads; 33, Clyde Navigation; 34, Charing-cross Bridge.

Delivered on May 23 *and* 25.

31. East India (Nawab of Surat)—Correspondence.
36. Nuisances Removal Act—Return.
35. Exchequer—Account.
41. Thames and Medway Conservancy Bill—Return.
52. General Committee of Elections—Mr. Speaker's Warrant.
26. Bills—Joint Stock Companies.
27. ——— Portland Harbour (as amended by the Select Committee.)
29. ——— Cinque Ports Act Amendment.

Convict Prisons in Ireland—3rd Report of the Directors.
Sale and Transfer of Land (Registration of Title)—Report of the Commissioners.

FIRST SESSION, 1857.

218. Army (Crimea)—Returns.

SESSION, 1856.

434. Poor Law Medical Relief—Return.

MEETINGS FOR THE ENSUING WEEK.

MON. Royal Inst., 2. General Monthly Meeting.
Architects, 8. Mr. T. H. Lewis, "Some Remarks on Domes."
Chemical, 8.
Entomological, 8.

TUES. Royal Inst., 3. Dr. J. P. Lacaita, LL.D., "On Italian Literature—the *Scientisti*—Marini—Galileo."
Linnæan, 8. I. Mr. Sclater, "On the Geographical Distribution of Birds." II. Dr. Hicks, "On the organs formerly described by him upon the halterers and wings of Insects, and on a new structure in the Antennæ." III. Mr. Frederick Smith, "On the aculeate Hymenoptera of Borneo."

WED. London Inst., 3. Prof. Robert Bentley, "On Systematic Botany, with especial reference to the natural systems of arrangement."
Geological, 8. Dr. H. Falconer, F.G.S., "On the Species of Elephant occurring fossil in England."

THURS. Royal Inst., 3. Prof. J. Tyndall, "On Sound, and some associated phenomena."
Philological, 8.
Photographic, 8.
Chemical, 8. Dr. Miller, F.R.S., "On the recent progress of Electro-Chemistry."

FRI. Archæological Inst., 4.
Royal Inst., 8½. Prof. Tyndall, "On M. Lissajoux's Acoustic Experiments."

SAT. Asiatic, 2.
Actuaries, 3. Anniversary.
Royal Inst., 3. Prof. E. Frankland, "On the Relation of Chemistry to Graphic and Plastic Art."

PATENT LAW AMENDMENT ACT.

APPLICATIONS FOR PATENTS AND PROTECTION ALLOWED.

[*From Gazette, May* 22.]

Dated 16*th April*, 1857.

1086. Peter Armand le Comte de Fontainemoreau, 39, Rue de l'Echiquier, Paris—An improved truck apparatus for moving and transporting stones and other heavy bodies. (A communication.)

Dated 18*th April*, 1857.

1103. Charles Benjamin Normand, Havre, France—Improvements in generating motive power by the employment of heated air, steam, and gases.

Dated 25*th April*, 1857.

1164. Matthew Smith, Heywood, Lancashire—Certain improvements in looms for weaving.

1166. Stephen Tonks, Joseph Breeden and William Breeden, Birmingham—A new or improved gas burner. (A communication.)

1168. Edmund Winder Otway, West Bromwich, Staffordshire—Improved apparatus employed in descending and ascending pits or shafts, and raising minerals and other bodies therefrom.

1170. Thomas Mann, Aldbrough, near Boroughbridge, Yorkshire—Improvements in horse powers.

1172. William Edward Newton, 66, Chancery-lane—The application of certain substances not hitherto used for food, as a source of nutrition and support to the respiratory organs of animals. (A communication.)

1174. William Cory, jun., Gordon-place, Gordon-square—An improvement in the manufacture of coke.

1176. William Pickstone, Radcliffe-bridge, near Manchester—An improvement in preparing or manufacturing dyeing matter, peculiarly applicable to cotton and other vegetable fibres, and useful when dyeing and printing other fibres and fabrics. (A communication.)

1178. Augustus Piggott Oldershaw, Doctors'-commons—An improvement in apparatus for skidding the wheels of carriages.

Dated 28*th April*, 1857.

1190. Heinrich Hochstaetter, Darmstadt—Improvements in the manufacture of matches.

1192. Wilson Ager, Rohrsburg, Pennsylvania, U.S.—An improved mode of hulling and cleaning rice.

1194. Kenneth Leith Sutherland, Junior United Service Club—An improved safety candle lantern.

1196. Denis Grundy, Tyldesley, Lancashire—Improvements in the manufacture of boots, shoes, and clogs.

1198. John Ramsbottom, Accrington, and John Bailey, Salford—Improvements in regulating the flow and pressure of liquids and fluids.

Dated 29*th April*, 1857.

1202. Charles Pascall, Norwood—Improvements in tile-making machinery.

1204. Andrew Peddie How, Mark-lane—An improved cork holder for bottles and other vessels.

1206. Aimable Antoinette Revel-Busquet, 39, Rue de l'Echiquier, Paris—Certain improvements in artificial flowers.

1208. Joseph Bottomley, Christopher Hodson, and William Fielden, Rochdale—Improvements in mules for spinning.

1210. John Henry Johnson, 47, Lincoln's-inn-fields—Improvements in apparatus for distilling, applicable also to the extraction of oils, colouring matters, and essences, and to the purification of gums. (A communication.)

Dated 30*th April*, 1857.

1212. Frederick Walton, Haughton Dale Mills, near Manchester—Improvements in the manufacture of wire cards for metallic brushes, and for carding fibrous substances, and in the machinery employed therein.

1214. Lucius Henry Spooner, Munlochy, Ross, N.B.—A new or improved manufacture of paper and paper pulp.

1216. Thomas Baldwin, Bury—Improvements in indicators for registering pressure.

1218. Samuel Mortimer, Halifax—Improvements in "screw gill-boxes" used in the preparation of wool and other fibrous substances.

1220. Charles Cammell, Sheffield—Improvements in the manufacture of axles or axle-trees for railway carriage, and shafts for various purposes.

1222. Thomas Frederick Hale, Bristol—An improved tap or cock.

1226. James Anderson, Glasgow—Improvements in the treatment, application, and use of maize or Indian corn.

Dated 2*nd May*, 1857.

1247. John Peter Booth, Cork—An improved manufacture of stuffing for beds, couches, cushions, and other seats.

1249. Tertius John Cooke, Wolverhampton—Improvements in the manufacture of knobs, roses, and escutcheons used for doors, drawers, shutters, and other similar purposes.

Dated 4*th May*, 1857.

1253. Thomas Beeby Moseley, 52, Upper Charlotte-street, Fitzroy-square—An improved pneumatic holder, adapted for photographic and other purposes.

1255. William Edward Wiley, 34, Great Hampton-street, Birmingham—Improvements in ever-pointed pencils.

1257. Speudlove Desborough, 42, Noble-street—An improvement in the manufacture of the seal flaps of envelopes and letter paper.

1259. George Travis, Mercaston, Derby—Improvements in apparatus used in the manufacture of cheese.

1261. Archibald Turner, Leicester—Improvements in the manufacture of elastic fabrics, and for the application of such fabrics to the manufacture of boots and shoes.

1263. Bennett Johns Heywood, Leicester-square—An improved construction of self-closing valve, and means for rendering the same applicable for supplying or discharging air, water, or other fluids.

Dated 5*th May*, 1857.

1265. John Talbot Pitman, 67, Gracechurch-street—An improvement in the construction of curry combs. (A communication.)

1267. Thomas Keddy, Birmingham—New or improved machinery for cutting sugar and other substances.

1269. William Bond Paul, Langport—Improvements in signalling upon railways.

1271. John Easterbrook and Robert Francis Drury, Sheffield—Improvements in machinery or tools for drilling and boring.

1273. Levi Bissell, New York—Improvements in trucks for locomotive engines.

Dated 6*th May*, 1857.

1275. George Kennedy Geyelin, 4, Lothbury—Making oscillating spring laths for beds, couches, and other purposes.

1277. William Hood, Edgbaston, Warwick—An improved charcoal filter for rectifying and cleansing spirits, and which is also applicable for filtering water and other fluids.

1279. Arthur Kinder, Worcester—Improvements in cutting irregular forms, and in the machinery or apparatus employed therein or connected therewith.

1281. Matthew Semple, Stonehouse, Plymouth—An improved pipe tube or stem.

Dated 7*th May*, 1857.

1287. Ernest Ziegler, Heilbronn, Wurtemburg—A substitute for animal charcoal, applicable also as a colouring matter.

1289. Charles William Ramié, Camberwell—Improvements in the mode of attaching knobs to spindles.

1291. Duncan Morrison, Bordesley Works, Birmingham—A new or improved manufacture of rollers or cylinders for printing fabrics.

1295. John Stenhouse, 15, Upper Barnsbury-street, Islington—Improvements in the manufacture of various kinds of glue or gelatine.

1297. George Brook Price, Bedford—Improvements in apparatus for affixing stamps and labels to letters and documents.

1299. James Hedgely, Westbourne-street, Eaton-square—Improvements in lamps for railway carriages.

Dated 8*th May*, 1857.

1303. Charles Edward Darby, Brymbo Iron Works, near Wrexham—Improvements in collecting the inflammable gases generated in blast furnaces.

INVENTIONS WITH COMPLETE SPECIFICATIONS FILED.

1357. George Woodward Morse, Louisiana, U.S.—An improved breech-loading fire-arm.—13th May, 1857.

1400. Charles Frederic Vasserot, 45, Essex-street, Strand—A typographical numbering apparatus. (A communication.)—19th May, 1857.

WEEKLY LIST OF PATENTS SEALED.

May 22*nd.*

2769. William Thomas Henley.
2789. John Orr.
2802. Francis North Clerk.
2810. William Woofe.
2812. Henry Hedgely.
2818. Joseph M. Saunders.
2819. Henry Turner Sourbuts.
2820. Henry Waller.
2824. Charles William Siemens.
2840. George Collier and James William Crossley.
2846. Noel Monnier.
2851. Rd. Archibald Brooman.
2854. Louis Dominique Girard.
2862. James Mizen.
2869. Julien Denis.
2901. Stephen Randoll Smith.
2936. Thos. and Wm. Wheatley.
2944. William Player Miles.
3038. William Spence.
3067. Rd. Archibald Brooman.
552. William Edward Newton.
667. Charles Lungley.
674. George Philcox.
690. James Garth Marshall.
716. John Shaw and William Manwaring.
717. William Edward Newton.
736. James Thomson.
853. George White.
860. George Gilmour.

PATENTS ON WHICH THE STAMP DUTY OF £50 HAS BEEN PAID.

May 18*th.*

1115. Charles Barlow.

May 19*th.*

1130. John Crossley and William Crossley.
1149. Joseph Kuczynski.
1160. Thomas Ball.

May 20*th.*

1327. Joseph Oliver.

WEEKLY LIST OF DESIGNS FOR ARTICLES OF UTILITY REGISTERED.

No. in the Register.	Date of Registration.	Title.	Proprietors' Name.	Address.
3991	May 22.	A Window-sash Fastener	E. and W. Taylor	Birmingham.
3992	,, 25.	A Flower and Fruit Gatherer	Jonathan White Heythorn	Nottingham.

Journal of the Society of Arts.

FRIDAY, JUNE 5, 1857.

NOTICE TO MEMBERS AND INSTITUTIONS.

The prizes awarded by the Society's Examiners to the successful Candidates at the June Examination in London will be distributed on the morning of Tuesday, the 23rd of June, at the Society's House in the Adelphi.

The Society's Annual Dinner will take place at the Crystal Palace in the afternoon of the same day. Lord Stanley, M.P., will preside.

The Sixth Annual Conference of the Representatives from Institutions in Union with the Society, is appointed to be held at the Society's House on Wednesday the 24th of June.

The Annual General Meeting for receiving the report of the Council and the Treasurer's statement of receipts, payments, and expenditure during the past year, and also for the Election of Officers, will, in accordance with the Bye-Laws, take place at 4 o'clock on the same day.

ART-TREASURES EXHIBITION.

The period fixed for the Society's visit to the Manchester Art-Treasures Exhibition, is the week commencing the 3rd August.

A Local Committee has been formed in Manchester to make arrangements for the Society's reception there.

That Committee is desirous of knowing, as early as possible, the number of members likely to visit Manchester, in order that information respecting hotels and lodgings may be obtained.

The Committee are making application to the principal Societies, the Exchange, and various large manufacturers, for the admission of members of the Society of Arts, during their visit, on showing their cards of membership.

THE SEDDON PICTURES.

The exhibition of these pictures has now closed.

It is thought that the following particulars in reference to Mr. Seddon, will not be uninteresting:

Thomas Seddon was born in 1821, the son of the well-known furniture-maker. He early evinced a taste for art, which, had he followed the bent of his own inclination, would have led him to qualify himself from the first by study for the career of a professional artist; but family circumstances rendered it expedient that he should aid his father's business. Till the age of about 30, therefore, the sole form in which he exercised art was the design of furniture; in this he stood high, and earned, in 1848, the silver medal of the Society of Arts.

Towards the same time, he began to apply himself with some closeness to the study of pictorial art, which, from the year 1851 onwards, became his regular profession.

Simultaneously with his early efforts in this direction, he exerted himself to the utmost in the diffusion of art education among the working classes. In 1850, jointly with Mr. Neville Warren, he founded, in Camden-town, "The North London School of Drawing and Modelling," which was conducted by eminent painters, and thronged by working men; at one time as many as 300, never, while Mr. Seddon was connected with it, less than 100. His unsparing exertions in this school (now absorbed in the Government scheme) brought on a very severe illness, which left his constitution permanently weakened.

"Penelope at her Web," his first exhibited picture, appeared in the Royal Academy of 1852. From this ambitious line of subject, however, he immediately digressed to landscape painting. His first field was Brittany. In 1853, he made arrangements with Mr. Holman Hunt for travelling in the East, whence he returned in 1854, with several works painted wholly or partly on the spot, the principal subjects being the Pyramids of Ghizeh, and Jerusalem with the Valley of Jehoshaphat, to the latter of which he devoted five months of work in the open air. In October, 1856, he started again for the East. An attack of dysentery on the voyage out left him in a state of great weakness when he arrived at Cairo, and he continued gradually to sink until his death, which took place on the 23rd November.

Highly valued, as Mr. Seddon was, in a large circle of friends for the qualities of honour and geniality which distinguished him, he had already by this time achieved a wider reputation as a painter endowed with may excellent gifts, and consummately faithful and authentic.

SOULAGES COLLECTION.

The managers of the Soulages Collection have issued to the subscribers to the Guarantee Fund for purchasing that collection, the following report:—

The collection having been carefully packed by Mr. J. Webb, was brought from Toulouse to this country almost without an accident.

The sum paid for insurance against all kinds of risk was £317 12s. 5d., whilst the amount claimed for repair of damages was only £39 12s. By permission of Lord Stanley of Alderley, President of the Board of Trade, the collection was publicly exhibited at Marlborough House, from 5th December 1856, to 31st January 1857, during which period it was visited by 48,093 persons, of whom upwards of 5,126 paid for admission on the students' days. Lord Palmerston, the Chancellor of the Exchequer, the Secretary of the Treasury, and Members of both houses of Parliament inspected the collection. Its artistic and commercial value, and importance to the manufactures of this country, were unanimously affirmed by the Press, and by competent judges. The Institute of British Architects appointed a committee to examine the collection, and in an able critical report they urged upon the Government the purchase of it. Memorials, also recommending the purchase, were sent from Edinburgh, Manchester, the Staffordshire Potteries, and other places; and some eminent decorators and upholsterers in the metropolis also addressed the Chancellor of the Exchequer in its favour.

The collection was offered to the Government at the price of £13,560. This sum, it was estimated, would be made up of the following items, the chief being actual payments, and the remainder estimates :—

	£	s.	d.
Purchase of the collection	11,000	0	0
Insurance at Lloyds, and Sun Fire Office ...	317	12	5
Valuation, Packing at Toulouse, and Transport to Bordeaux	686	15	0
Freight from Bordeaux to London, and Custom Agents' Charges	182	18	1
Compiling, printing, and binding catalogues, £452 19s. 3d,—less £97 1s.	355	18	3
Law charges, clerical assistance, general printing, repairs, etc.,—estimated at	200	0	0
Interest and bankers' commission in paying money at Toulouse,—estimated at	757	0	0
	13,500	3	9

The principal object of the exhibition was to invite public criticism, and the managers believe that never since Government has spent public money in making purchases of objects of Fine Art, has there been so sound, safe, and healthy a course of action as in the present case; they therefore regret that the Government did not see fit to be guided by it, but declined the purchase.

Upon receiving the refusal of the Chancellor of the Exchequer, the managers determined still to relax no efforts to preserve for public instruction the collection in its integrity, and at the same time to relieve of all responsibility the subscribers to the Guarantee Fund. Both these objects have been successfully accomplished. As will be seen by the accompanying memorandum, the committee of the Art Treasures Exhibition at Manchester have purchased the collection for £13,500* as trustees, agreeing to offer it for sale to the City of Manchester after the close of the Manchester Exhibition. If the offer be declined by Manchester, then the whole or half of the collection will be again offered to Government. Should a public sale of all or part still be necessary, the Manchester committee have agreed to give up any surplus to the original subscribers, to be employed as they may think fit in promoting the Fine Arts according to the original agreement.

(*Signed*) D. C. MARJORIBANKS.
M. UZIELLI.
HENRY COLE.

May, 1857.

MEMORANDUM REFERRED TO.

The undersigned Dudley Coutts Marjoribanks, Matthew Uzielli, and Henry Cole, the Managers of the "Soulages Collection" under the annexed memorandum (hereinafter designated "the London managers") having purchased and exhibited it in conformity with the terms of that memorandum, and having at present failed to induce Her Majesty's Government to exercise the option of purchase reserved to them by Clause 7 of the memorandum, have, in accordance with Clause 8 of the memorandum, and in order to secure the collection for permanent exhibition and public instruction, and to prevent its dispersion into private hands, agreed to transfer the same to the undersigned Thomas Fairbairn, James Watts, Thomas Ashton, William Entwisle, Joseph Heron, Edmund Potter, and Sigismund James Stern, Esquires, hereinafter designated "the Manchester managers," upon the following terms and conditions, viz.:—

1. The sum of £13,500 (being the amount of the prime cost of the collection, including the expenses incurred in reference to it to the present time) is to be paid by the Manchester managers to the account of the London managers at their bankers, Messrs. Coutts and Co., in London, by or before the eighth day of April 1857, to be applied by the London managers in discharge of the liabilities of the subscribers to the memorandum, and without any control or responsibility on the part of the Manchester managers as to the application of the money.

2. On such payment being made, the collection is to be forthwith packed and forwarded to Manchester at the risk and expense of the Manchester managers, and to be exhibited at the Art Treasures Exhibition about to take place there.

3. Until the expiration of 28 days next after the close of that Exhibition, the Corporation of Manchester or any other person or persons who may be desirous to purchase the collection entire for purposes of *permanent* public exhibition and instruction in Manchester, and will engage to devote it to such and no other purposes, shall have the pre-emption of the collection at the sum of £14,175, and notice of this pre-emption shall be published by the Manchester managers in two at least of the Manchester newspapers once in each week during the 28 days previous to the signing of the contract.

4. If such right of pre-emption be not claimed, and a contract to that effect signed within such 28 days, the President of the Committee of Her Majesty's Privy Council on Education shall then have the option of purchasing the collection entire for public purposes at the *like* sum during the then next 28 days, and notice of such option shall be given to him and also to the London managers immediately after the expiration of the first mentioned period of 28 days.

5. If such purchase of the entire collection be declined by the President of the Committee of Her Majesty's Privy Council on Education, then he and the Manchester managers shall have the further right to purchase it between them in equal portions at any time during 14 days next after the expiration of the second above mentioned period of 28 days, and similar notice of such further right of purchase shall be published and given as required in the preceding Clauses 4 and 5.

6. If the parties last before named elect to purchase the collection between them, each shall appoint an agent to represent such party in the division to be made of it, and such division shall thereupon be made by each agent (commencing with the Manchester agent) selecting an object alternately *at the price put against* each object in a priced catalogue of the collection authenticated by the signatures of the parties hereto, (the whole of the prices in such catalogue amounting to the before mentioned sum of £14,175), and if only one of such parties elect to purchase one half of the collection, then the other party shall appoint an agent to represent them in the selection and division of the collection as herein before stated.

7. If the collection be not disposed of as above mentioned, or only half of it be so disposed of, then the Manchester managers shall (with the concurrence of the London managers) cause the collection, or the undisposed portion of it, to be sold by public auction in London with all reasonable speed, and not later than the 1st of June 1858; and if a less sum than £14,175 be realised on the ultimate disposal thereof, the loss shall be wholly borne by the Manchester managers, and if any surplus arise therefrom such surplus shall be accounted for and be paid over by them to the London managers, to be disposed of by the latter, as provided for by Clause 9 of the memorandum.

The Manchester managers signing these articles shall be considered as possessed of the legal ownership of the collection when handed over to them by the London managers, and as the proprietors thereof for the time being, subject only to the terms and conditions before expressed, and shall be personally responsible to the London managers for the due performance of those terms and conditions.

9. If the before mentioned sum of £13,500 be not paid by the day stipulated, the London managers are at liberty to declare this agreement at an end.

D. C. MARJORIBANKS, } London Managers.
M. UZIELLI,
HENRY COLE.
THOMAS FAIRBAIRN.
JAMES WATTS.
THOS. ASHTON.
WILLIAM ENTWISLE.
JOS. HERON.
EDMUND POTTER.
S. J. STERN.

The following letter, in reference to the ultimate disposal of this collection, has been received by the Council. The subject will be brought before the next Conference of the Institutions :—

SIR,—Your letter of the 29th ult. duly came to hand, and I beg to thank you for the trouble you have taken with our communication respecting the Soulages Collection.

I regret to trespass further on your kindness concerning the matter, but fearing, from the tenor of your letter, that our object is not clearly understood by the

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* When the accounts are closed, if there be any balance it will be returned of course to the Manchester Committee.

Council of your Society, and that our proceedings may have appeared to them to indicate a desire to interfere unnecessarily and unwarrantably with the disposal of the collection, I beg to explain our aims and motives more fully.

In common with most persons who are desirous that the National Museums, collections of Works of Art, &c., should be extended and utilised as much as possible, we regretted the rejection by government of the Soulages Collection; and it was with pleasure we learned, from the *Illustrated London News* of the 28th of March, that a number of gentlemen connected with Manchester had purchased it for the purpose of exhibiting it in the Art Treasures Exposition. We also gathered from the same source, that at the close of the Exhibition, it was intended to offer the collection for sale to the citizens of Manchester, and in the event of its being refused by them, to afford the government another opportunity of securing it for the national use.

Believing that the gentlemen who thus generously came forward to render the collection available to this extent for public gratification and instruction, would consent—in deference to the expressed wish of any considerable number of their fellow-countrymen—to abandon their intention of tendering it to the inhabitants of Manchester, and offer it to the government immediately on the termination of the Exhibition, we ventured to request you to bring the subject under the notice of your Council and of the Institutions associated with your Society, as it appeared to us to be one specially appropriate for their consideration. Allow me to add that an expression in the address of the Executive Committee to H. R. H. Prince Albert, on the occasion of the opening of the Exhibition, would appear to give some degree of countenance to our opinion. Speaking of the Soulages Collection, the Committee say, "We would express a confident hope that it may yet be preserved in its entirety, after the close of the Exhibition, *for more general public instruction*." The italics, it is only proper to say, are mine.

But it may be said, the government, if it had the opportunity, would again refuse to purchase the collection. We think otherwise. The former rejection was made on the eve of a general election, when the government was naturally anxious to stand well with all parties, and was mainly, we believe, in deference to the implied wishes of the so-called economists, who are continually crying "Retrenchment, retrenchment." Now that the excitement and pressure of the election are over, we believe that if the question were urged on the consideration of Parliament by the Societies and Institutions whose special object is the spread of art, science, and literature, the national purchase of the collection would be the result.

If you should deem the matter worthy of further notice, perhaps you will be good enough to bring it again before the Council of your Society.

Regretting that circumstances have prevented me from replying earlier,
I am, &c.,
E. BRUNT, Secretary.

Pottery Mechanics' Institution, Hanley (late Shelton),
Staffordshire Potteries, May 22, 1857.

MEMORIAL TO LORD PALMERSTON.

The Council have received from the committee of the Pottery Mechanics' Institution, Hanley, Staffordshire, a copy of a resolution passed at a meeting of that body, held May, 1857, as follows:—

"That this committee begs to express its entire concurrence in the sentiments enunciated in the memorial recently presented by the Society of Arts to Viscount Palmerston, and also its opinion that the society—from its long, honourable, and useful labours in the promotion of arts, commerce and manufactures, as well as from its connection with the great bulk of the Mechanics' Institutions in the kingdom—is eminently qualified to become the centre of diffusing—through the medium of these Institutions—any assistance which the government may determine on rendering to the furtherance of the Scientific and Industrial Education of the People."

THE PROPOSED ECONOMIC MUSEUM.

The following documents, taken from the Minutes of the Council of the Society of Arts, may serve to explain the origin and purpose of the proposed Economic Museum, commenced in the Society's name, and presented to the Government Department of Science and Art, with a view to its becoming the nucleus of a Special Museum for the instruction and benefit of the Working Classes.

Report No. 1 (*on the proposed Economic Museum*), *addressed to the Chairman of the Council, by Mr. T. Twining Jun., April,* 1857.

SIR,—The experience acquired since 1847 in the managing committee of the Labourer's Friend Society, led me to a conviction, that much of the privation, discomfort, and ill-health to which the working classes are subject in this and other countries, and many of the errors and failures of the friends of the poor in their benevolent endeavours, might be avoided by a more general diffusion of that kind of practical knowledge in matters of domestic and sanitary economy, which may be termed the science of common life. I perceived, at the same time, that the only way to make that knowledge popular, was to offer it in an easy, familiar, and attractive form; and thus I was naturally led to the plan of establishing exhibitions and permanent museums of domestic economy.

I began in 1850 to collect notes for carrying out this idea, which received the sanction of the Council of the Society of Arts on the 21st of July, 1852, and was honoured, in 1854, with the approbation of the Emperor of the French. In March, 1855, it was fully developed in a memorandum addressed to Lord Ebrington, then our chairman, and which was extensively distributed in Great Britain and the Colonies, under the joint sanction of the Society of Arts, the Labourers' Friend Society, and the Metropolitan Association for Improving the Dwellings of the Industrious Classes. I also published abridged translations of this document in German and French, and in the latter form it was submitted to the International Conference held at Paris in July, 1855, by the President, the Vicomte de Melun. The Assembly passed a vote, recommending that collections of articles of domestic economy should be formed in the several countries; and, in pursuance of this resolution, a committee was at once appointed for taking advantage of the facilities offered by the French Universal Exhibition.

Thanks to high patronage, and to the friendly support of M. Le Play, then Commissary-General of the Great Exhibition, the exertions of the eminent gentlemen composing the committee were as successful as the limited time to which their operations were confined would possibly allow. On the 15th of September, a Gallery of Domestic Economy, annexed to the "*Palais de l'Industrie*," was inaugurated in the presence of a deputation of the Society of Arts; and on the 29th of October, the Emperor and Empress, accompanied by Prince Napoleon, inspected this collection for nearly two hours, and expressed to me the interest they felt in it in the most courteous terms.

My worthy friend, M. Ducpetiaux, took up most warmly a means of doing good, of which, in his incessant labours for the benefit of the poor, he had already felt the desirableness; and his exertions, seconded by several eminent coadjutors, and by the patronage of the Belgian Government, brought about the very complete and successful specimen of an Exhibition of Domestic Economy, which the delegates of the Society of Arts to the Brussels Congress witnessed in that city in September last.

The idea of teaching the science of common life, by means of economic collections, is susceptible of being carried out in various forms. Of these, the temporary exhibition is the most brilliant, and is not without other advantages; but I have been throughout of opinion, that the most practically useful lessons would be those taught by the less commercial, and more educational organization of permanent museums, gradually and carefully developed, and I was particularly desirous that the latter form should be carried out in England.

The Council of the Society of Arts has in this afforded me an assistance for which I feel truly grateful, by allowing the collection, which I have been happy to make at my own expense, to bear the Society's name, thereby securing many interesting donations, among which I will, for the present, only mention the following:

From the Labourers' Friend Society, a set of large coloured representations of their model dwellings, with other plans and Drawings; from the "Société des Cités Ouvrières de Mulhouse," plans and drawings of their establishments; from MM. Charles and Co., Paris, sundry cooking appliances; from M. Goss, Bayeux, France, a valuable series of articles in fire-proof porcelain; from M. Redier, Paris, an assortment of cheap clocks; from J. Barrow, Esq., an Esquimaux Dress, &c.; from T. Gibbs and Co., London, a collection of grains, seeds, &.; from Price and Co., Patent Candle manufacturers, specimens illustrative of their productions; from M. Alexandre, Paris, a specimen of his cheap melodium, or village organ, &c., &c.

It may be seen, on referring to the Minutes of the Meetings of Council of the 12th and 19th of December, 1855, that whilst authority was given me for forming an Economic Collection, it was arranged that if "Government should at any time agree to take charge of the Economic Museum, with a view to its becoming a national institution, the same should be made over to them."

I am happy to be able state that a favourable opportunity now presents itself for carrying out this intention, by obtaining the annexation of our collection to the Educational Museum now being formed at South Kensington. Notwithstanding the all but insurmountable obstacles opposed to my progress by my continued ill-health, I have succeeded by slow degrees in bringing some of the classes of the Collection, and particularly the Alimentary department, to so forward a state that, with the additions which might be at once made from the stores remaining in the hands of the Government from the Exhibition of 1851, and with the contributions which would spontaneously flow in as soon as it could be made publicly known that the Museum of Domestic Economy was become an accomplished fact and a national institution, the whole might be made ready for public display in a few months, and certain portions within a few weeks. I have every reason to believe that if the Council will authorise me to offer the Collection to the Government, it will at once be accepted on a mutual understanding that no claim whatever will be made by the Society of Arts for any expense incurred in its formation, and that, on the other hand, it will be developed and exhibited in accordance with the views which have directed its formation, and of which the following is a summary statement:—

Purpose of the Economic Museum.

Though the lessons of Household and Health Economy intended to be taught by the Economic Museum may be useful to all classes of society, they will be more particularly addressed to the working classes, being designed to impart to them, in an easy and agreeable manner, the knowledge of *common things*, and to show them how they may promote the health, comfort, and happiness of themselves and their families. Amongst the various means combined for this purpose may be mentioned the following:—

I. To collect at home and obtain from abroad, and to exhibit with explanatory labels, in the manner most convenient for inspection, specimens of furniture, household utensils, clothing, food, and, in short, of every article or contrivance which, from its cheapness, combined with good quality, its convenience, its genuineness, or its conduciveness to health, may be deemed likely to promote the comfort of the working classes in Great Britain or the colonies.

II. To display likewise in series or groups all articles of common use; showing by instructional labels, diagrams, coloured drawings, &c., how they are obtained or prepared, imparting other elements of useful knowledge, and referring for fuller illustrations to such institutions as the Geological Museum in Jermyn-street, the Botanical Museum at Kew, or other sources of information which may be within reach.

III. More especially to teach the working-classes how to distinguish the relative qualities of the articles used by them, such as genuineness, wholesomeness, durability, &c., and consequent relative value; so that they may be guided to lay out their money to the best advantage, and be guarded against adulteration and fraud.

IV. The selection and arrangement of the articles and illustrations of the museum, to be ruled by much the same principles as would guide a professor intending to deliver a course of popular lectures on "Household and Health Economy," whilst we may imagine the text of the lectures as cut up and appended to the articles in the form of labels.

V. Care to be taken not to interfere unnecessarily with the existing channels and customs of trade; but inventors, patentees, and others entitled to exceptional favour, to be allowed to deposit samples of their goods in the museum under certain restrictions.

VI. To make manifest, by the study and comparison of what exists, the deficiencies which have to be supplied; and to point out these to inventors and manufacturers, endeavouring to stimulate their exertions by the assurance of publicity and patronage.

VII. To show by models, drawings, and working plans, accompanied with estimates, results, &c., how architects, builders, and benevolent capitalists may, with a prospect of a good return for their capital or their labour, raise improved habitations for the working classes in town or country, or renovate with advantage existing dwellings. Also, how the arrangements of benevolent etablishments of every description may be economically improved.

It has become evident that model dwellings, and healthy and comfortable lodging-houses, will not become the ordinary type, till builders and speculators can be convinced, not only that they may be made to yield that return which a philanthropist would content himself with, but that they may become almost as remunerative as dwellings of the old style.

To accomplish this we must put in requisition every available building material and contrivance, every improvement in fittings, &c., which may cheapen the promoting of health and comfort.

VIII. To promote improved contrivances for ventilation, sewerage, and other sanitary purposes, cheap medical and surgical appliances, and means for preventing or alleviating the accidents, injuries, and diseases which attach to various industrial occupations.

IX. To illustrate by everything that may be usefully suggestive or rationally interesting, the condition of the humbler classes in all parts of the world.

X. To collect in a library attached to the Museum publications and documents required for completing the information given on the labels, concerning the various articles displayed in the Museum; or which may be useful for reference to the working classes or their friends, as bearing on their household economy, their earnings and expenditure, their habits, wants, and resources; and likewise the laws which specially affect them and the institutions established for their benefit.

XI. To publish from time to time an Official Catalogue, less intended for the use of visitors to the Museum, for whom it will be in a great measure superseded by the system of explanatory labelling, than for reference and instruction out of the Museum, as a Hand-book of Household and Health Economy.

XII. To publish, or promote the publication of, sets of diagrams and coloured illustrations, of the nature of those displayed in the Museum, and which may serve to facilitate the teaching of the Science of Common Life in schools, Mechanics' Institutions, &c.

XIII. To consider the Economic Museum established in the Metropolis as a central institution, embracing the whole of the requirements of the working population of the British Empire, and forming a type to be imitated in the populous towns of the United Kingdom and the Colonies, on a more or less comprehensive scale, according to the requirements and resources of the locality.

XIV. To favour the formation and affiliation of these local collections by means such as the following:

(*a*) By adopting in the character and size of the specimens, and in the fittings and appliances for displaying them, a style as simple, cheap, and compact as possible, with a view to show what may be done with limited means in a limited space.

(*b*) By showing how the commonest things may be rendered interesting and instructive, and how objects, which elsewhere serve merely to excite a passing curiosity, may, by appropriate labelling, be made to impart lessons of practical knowledge and improvement.

(*c*) By collecting and distributing duplicates.

(*d*) By giving in the Museum Catalogue every kind of information and advice which may facilitate the getting together and the arranging of the local collections.

XV. To constitute the Economic Museum a medium for the interchange between Great Britain and other countries of inventions, contrivances, publications, and authentic information, bearing on the physical and intellectual improvement of the people; the Museum library becoming a centre for international correspondence on all matters connected with the well-being of the industrious classes, according to the plan recommended by the Philanthropic Congress, recently held at Brussels, and which it is intended to organise systematically at the next meeting, to be held at Frankfort, in the autumn of the present year.

With regard to classification, I have found it practically convenient to maintain that of my *Memorandum*, with a few trifling alterations, bringing it to the following arrangement:

Class I. Building designs. Models, drawings, and plans, showing the exterior and interior arrangements of dwellings and buildings of every description, existing or proposed to be constructed for the use or benefit of the working classes.

Class II. Materials for building and household purposes.

Class III. Fittings, furniture, and household utensils.

Class IV. Fabrics and clothing.

Class V. Food, fuel, and other household stores.

Class VI. Sanitary department.

Class VII. Educational department.

Class VIII. Miscellaneous articles not referable to the foregoing classes.

Class IX. The economic library.

It was suggested in the *Memorandum* that series of articles and appliances appertaining collectively to various occupations, such as those of the miner, the fisherman, the emigrant, &c., or illustrating the condition, occupations, and habits of the working classes in various parts of the world, might be collected in a special class; but I find it will be more convenient to place these groups in various parts of the museum that may happen to afford space suitable for their display. The same may also be done with portraits, autographs, &c., of working men, who by their genius and honourable industry have raised themselves to an eminent position in society.

I have the honour to be, sir,
Yours respectfully,
T. TWINING, Jun.

Extracts from Minutes of Council of April 29, 1857.

Resolved: That Mr. Twining be authorised, on the part of the council to offer to transfer to the Department of Science and Art the Economic Museum formed at the Society's house under Mr. Twining's superintendence; such presentation being made free of all charge or claim on the part of the society, for any expenses incurred in its formation or in connexion with it; the department undertaking to develop and exhibit the collection in such a manner as may be most conducive to the public advantage and in accordance with the views which have directed its formation.

Resolved: that the best thanks of the council be presented to Mr. Twining for his exertions in commencing and establishing the Economic Museum, and for his liberality in supplying funds necessary for that purpose.

Second Report on the Economic Museum.

Sir,—I beg leave to report to the council that I transmitted to the Department of Science and Art a copy of the resolution by which I was empowered to offer to Government, in the Society's name, the collection of articles of domestic and sanitary economy, and I have the pleasure to report the acceptance of the same.

Whilst I take this opportunity of renewing my sincere acknowledgments for the courteous assistance with which I have been favoured by the council and by the officers of the Society, I may express a hope that the council will still continue to foster the success of an undertaking, having for its object the improvement of the physical condition of the working classes, and which may be considered as auxiliary to the society's efforts for promoting their intellectual development. I trust that the society may continue to be a medium for the importation of foreign improvements, and that the ramifications of its influence throughout the United Kingdom and the Colonies, will continue to be available for collecting and diffusing sound principles and improved appliances in every department of household and health economy,

I have the honour, &c., &c.,
T. TWINING, Jun.

Perryn House, Twickenham,
May 13, 1857.

Home Correspondence.

INCREASED SUPPLIES OF COTTON.

Sir,—Having perused with interest the proceedings of the Society of Arts, at their meeting on the 13th inst., on the subject of obtaining from the East Indies a supply of cotton in our manufactures, I am prompted to offer to the Society a few observations which the paper of Mr. Smith and the discussion to which it led have suggested to me. Although the cotton districts of India comprehend a vast extent of territory, I believe that certain soils and climates are especially adapted to particular varieties—for example, that *Dacca* is favourable for the growth of that fine and elastic fibre from which is fabricated the muslin of that name, while, in Ceylon, the soil is adapted only to the production of the coarser kinds, from which the common clothing of the peasantry is manufactured; hence by inquiries and observations in various quarters, it may readily be discovered where the American cotton, used in our English factories, can best be raised. The offer of a premium would encourage enterprising individuals to direct their attention to the subject in different parts of the country.

The system of land revenue assessments in India is admitted to constitute a formidable obstacle to those who might be disposed to invest capital in augmenting the supply of cotton and other valuable productions available to commerce and the arts, and the impoverishment of the landholders under its operation, does assuredly present a wide contrast to the condition of the country in ancient times, when it was reclaimed and settled by a thriving and intelligent people, whose skill and enterprise are attested by the stupendous works which they executed. From the ruins of those works being found in the midst of dense forests, it is evident that the lands must originally have been cleared and reclaimed by great labour, and from the ancient tenures, where they have been preserved, as in Ceylon, it is also proved that they were accomplished under a system which held out great encouragement to the settlers, that the rights of property were held sacred, the landmarks respected, and that the contributions to the state, as well as for local and municipal purposes were light and freely conceded, the former not exceeding 1-10th of the produce, and the communities held themselves responsible for the collection of them.

Although tanks and water-courses for irrigation of the lands were often executed by the state, they were as often undertaken by local committees and by individuals, whose lands they fertilised, and even in cases where the work was executed by slaves, their industry was stimulated by the allotment to them of cleared lands as hereditary tenants, and such was the respect acquired by the possession of land, that the rents were often, in a generation or two, redeemed or remitted. To contend, therefore, that the rent of land has never been private property in India, or that the state has a just right indefinitely to raise its assessments, is a mistake which alone can be ascribed to our being the immediate successors to the Mahomedans, a race who acknowledged no rights in the infidel Hindoos, and were intent only on using their power to extract from the impoverished landholders the funds they required for the support of their conquering armies. The scourging of the collectors and landholders in the palace of Tippoo Sultan, at Seringapatam, as witnessed by the missionary Swartz, typified the practices which had prevailed for ages, especially in the decline of the Mogul power, and which are not yet wholly extinct with our native agents.

The average rate of assessments throughout India has been estimated at 70 per cent. of the produce, leaving 30 per cent. for the landholder, and to show the effect of a permanent settlement, even on these terms, it may be sufficient to refer to the Zemindary settlement in Bengal, where the exactions of the state had amounted to 10-11ths of the produce, and although the liability to discharge this exorbitant assessment ruined the first Zemindars, the effect of the permanent limitation of the public demand, led to the introduction of capital in improving the cultivation, and in reclaiming the waste lands, so that, in 20 years, the 1-11th share of the landholder was equivalent to the fixed rent of 10-11ths paid to the government, while a better guarantee was afforded for the payment of the taxes. such having been the effect of the permanent settlement, alalthough, with all its defects, there is enough reason to hope that the limitation of the public demand upon the landholder throughout India would encourage the introduction of capital, both in extending the cultivation of impoverished districts and in promoting the improved culture of cotton, and other valuable products, adapted to the British markets. Even if leases for 20 years were to be granted, at fixed and moderate rates of assessment, with the right of redeeming the rents on equitable terms, capitalists might be induced to come forward, but while the demand is fluctuating the prospect is hopeless.

In regard to the defective administration of justice in India, it is much to be regretted that the supreme judicatures, established under Mr. Pitt's Bill, had not been originally invested with an appellate jurisdiction from the native courts, by which the laws would have been progressively assimilated in harmony with the principles of the English common-law, and the native customs recognised and respected when not at variance with those principles.

The execution of works, which would provide for the irrigation of the lands, and facilitate the transport of produce, need not depend wholly on the government, although, at the outset, its guarantee would encourage capitalists to undertake them. I apprehend, however, that it is a mistake to assume that the railways, when completed, will not be available for the conveyance of cotton and other heavy goods. The assistance afforded by them in supplying Bombay with water, during the late drought, affords a proof that they will materially aid in bringing cotton, and other bulky commodities to market—as they do in the rapid distribution of coal in this country. The completion of these important works should, therefore, be accelerated.

That encouragement should be given to European enterprise in India it is hardly necessary to urge at this day. The Mussulmans, during six centuries of occupation, founded a population of ten millions in the country, and in one century we have scarcely introduced as many hundreds of permanent settlers. As there is no field for any except those whose capital, skill, and enterprise would benefit the country, there can be no reason why the utmost encouragement should not be held out to them. Indeed, it is an obvious policy that we should augment our numbers, as well for our own safety as for the moral and material improvement of the country.

A service of several years in continental India, and also in Ceylon and Java (two Hindu colonies), has left indelible impressions on my mind of the effects of past systems, and of the means by which those countries may regain their prosperity, and contribute with our co-operations to the augmented resources of the empire.

If there should be any desire for further information as to my views of Indian tenures and finance, I beg to refer to parliamentary papers which were laid before the House of Commons on March 1832, and March 1833.

I am, &c.,
W. COLEBROOKE,
Major-General.

Datchet, May 19, 1857.

MR. BINKS'S PAPER ON NITROGEN IN STEEL.

Sir,—I had been informed that this paper, announced for reading at the commencement of the present session of the Society of Arts, had been postponed, pending the result of working certain patent processes. From the remarks of many of the speakers, this impression seemed to be general. In the expectation that we were to be gratified by hearing particulars of another addition to the numerous improvements propounded during the past twelve months in the manufacture of iron and steel, and the exhibition of the results, I was induced to bring for comparison part of some samples of iron and steel of a high character, manufactured by the processes already in use in this country, which I am collecting for the Jermyn-street Museum. I was particularly led to do this when I noticed that Mr. Fairbairn was to be the chairman of the evening, because these remarkable samples were made by the beautifully simple, but little understood, process of boiling malleable iron direct from the grey pig, without the intervention of the refinery, a process on which Mr. Fairbairn and the inventor, Mr. Joseph Hall, had lately been in correspondence. Having the specimens by me, I seized the occasion to exhibit the matchless capabilities of an invention of the origin of which Mr. Fairbairn expressed his regret he could find no printed account, when writing his late article in the *Encyclopædia Britannica*, and showing, by the tenacity, colour, and fibre of those specimens, that the boiling process was already perfected to a degree which rendered it improbable that Mr. Nasmyth's steam, or any other invention, could carry that perfection farther. As I had been suffering under the same disadvantage for ten years, anxious to learn the early origin of the boiling process, and unable, even from my father's extensive experience, to obtain the information I desired, I seized on the facts, very lately presented to me, with the avidity and enthusiasm which I can never avoid feeling towards the true invention of any real improvement in our great arts. My love of awarding justice in such cases, and placing the right man in the right place in the Temple of Fame and national utility, as I have endeavoured to do, with Henry Cort, is a peculiarity I cannot avoid, and I often wish it were less singular. The invention of a process which enables the aid of the refinery to be dismissed, and produces direct from the pig, with certainty and economy, qualities of iron far superior to any it is possible to obtain by the original puddling process, is as great a stage in the history of this manufacture as any of the few great steps on record. Yet from the habitual neglect of taking pains to couple the name of the inventor with his invention, the first authorities were quite ignorant of it, until the allegations made by Mr. Bessemer at Cheltenham brought the facts to light. It seems as natural to name the author of an important invention as to name the general who won a great battle, the place where it was fought, the kingdom which contained that place, or the monarch who ruled over it. The history of inventions is as confused a subject as any other history without particulars, and, indeed, Bacon, no mean authority, tells us it is these particulars of the steps by which the result has been gained, which are alone of value, and that systematic statements of results are comparatively worthless. I have read accounts of the boiling process, in which the care to avoid naming the author or his progress in discovery has led to a total misrepresentation of the operation itself. One remarkable feature disclosed by it is, that very intense heat does not necessarily, as hitherto supposed, impair the quality of iron; that it is the hitherto imperfect methods of applying the heat whence this impression has been derived, depriving the puddler of the most valuable agent for purifying. Mr. Binks's paper proving to be a pure scientific thesis, without specimens, there was not the scope expected for practical discussion or comparison. Accidental criticism was, in fact, useless upon a chain of such close evidence, elaborated with so much accuracy and time. He makes a strong array of *nitrogenised facts*, and I trust he will pursue the valuable field of inquiry until he produces conviction one way or other. Either decision will increase our store of valuable facts. I may notice, on his reference to Mr. Heath's process, that the first practice was to make the carburet of manganese *separate from the steel*. In this case the nitrogenised coal tar did *not* approach the steel. The nitrogen must have been carried *in the metallic carburet*, and it might be well worth while to analyse this carburet, to ascertain if it is remarkably nitrogenized. The effects of the original practice, and of the departure from it (which caused the frightful litigation) by introducing the coal tar *with* the steel, were precisely the same. If the nitrogen theory is supported in the practice of making steel by adding carbon to malleable iron, how is it to apply when steel is arrived at in the opposite direction by *depriving cast-iron* of its carbon? The bar of steel I exhibited was produced simply by arresting the boiling process at the proper state, yet here there was no special nitrogenising action at that moment, more than at any other period of the process.

I am always struck, at your discussions on iron, with the strong antagonism displayed between the scientific men and the practical commercial men. It is greatly to be desired, that some means should be devised to bring their differing attainments out of a barren opposition into a fruitful union. The idea occurred to me with great force after the discussion, that it was a strange fact that an interest so extensive, so important, and so wealthy as the Iron Trade of Great Britain, possessed no central institution to represent it in the metropolis. There is no museum specially devoted to this paramount branch of metallurgy, no building, such as is possessed by trades of infinitely minor importance, where its members can meet to give and receive information. I believe none of our great industries have so little intercommunication upon their principles and practice, and the natural results follow of a great variety of imperfections and inequalities of process. What a marked and astonishing contrast was presented by the rough nitrogenous shaggy fibres of the specimens of Blaenavon iron, considered the best in Wales, which were lying on the table, and the exquisite silky perfection and colour of the fibres I placed beside them. The contrast was so great, that it was difficult to believe the specimens were the product of the same age and country. I was, indeed, asked what remarkable samples of foreign iron these were. Yet the whole difference lay *in the process;* the Blaenavon materials are the cream of Wales; the Bloomfield materials, being only a bar work, are what can be found in the market. Surely this great branch of industry ought to have a suitable focus, to concentrate, compare, and exhibit its interests and its improvements, and where the clashing hostility of the "scientifics" and the "practicals" might be soothed into a beneficial alliance for the national advancement. I wish Mr. Scrivenor, the historian of the iron trade, would direct his energies to such an accomplishment.

I am, &c.,
DAVID MUSHET.

May 30, 1857.

BLACK-BONED FOWLS.

Sir,—In reference to the question of black-boned fowls, my present knowledge would lead me to affirm that a fowl with bones of a black colour does not exist. The seat of the pigment which is so abundantly developed in the variety of fowl sometimes called the "Silk fowl," which is the subject of Mr. Temple's remarks, is, as Hunter shows in the preparations Nos. 48, 2056, and 2057, Physiological series, Royal College of Surgeons,[*] the periosteum or membrane covering the bones, the membrane continued from it upon the tendons, and the skin, whence the variety has been called the "Negro fowl." In a specimen which I dissected, when preparing the Catalogue of the Hunterian Collection, the osseous substance, when exposed by the removal of the black periosteum, was as white as in ordinary fowls.

The Dutch ornithologist, Temminck, regarding the black variety as a distinct species of fowl, calls it "Gallus morio." Most naturalists view it as a variety merely of the variously modified "Gallus domesticus," or "Phasianus Gallus," of Linnæus. All agree in ascribing to the so-called "black-boned fowl" the excellent qualities for the table which Mr. Temple recommends; and I cordially concur in the hope that his praiseworthy endeavours to introduce the variety into our farm yards may be attended with success.

I am, &c.,
RICHARD OWEN.

British Museum, May 30, 1857.

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[*] Described in my "Catalogue," Vol. i., p. 12; Vol. iii., p. 263; 4to. 1836.

BLACK-BONED FOWLS.

Sir,—In your last letter published on this subject, Mr. Pettigrew has said, "the colour of the bones in different animals varies exceedingly; though generally white, there are yet many shades and gradations, probably in most instances influenced by the food upon which the animals are fed." It is an old fact, well known to physiologists, and referred to in all their books on the subject of the growth of bone, that when young pigs have been fed with madder mixed in their food, their bones soon become of a red colour, and (the bony deposit taking place on the exterior) a ring of a madder colour is found on transverse sections of a bone's shaft, corresponding to each period of giving madder, with an uncoloured ring intervening for each period when it was omitted. Now, Mr. Temple, in his letter of May 13th, has said the blackness of the bones of the Honduras fowls, he is convinced, "does not arise from any accidental circumstance, but that it is a permanent feature, belonging to a distinct species."

Their habitual food is not, perhaps, an accidental circumstance, and as Mr. Temple has bred them, may I inquire if the Honduras fowls are fed with any particular corn or other food, that we might obtain and try to blacken the bones of our English fowls, which it may be possible to do; although, the black combs and gills of the Honduras fowls are, I imagine, also a peculiarity not belonging to any fowls at present in England.

I am, &c.,
"RARA AVIS."

May 30th, 1857.

Proceedings of Institutions.

Pendleton.—The new Mechanics' Institution, in Gardner-street, Pendleton, was inaugurated on the 27th April, there being a tea-party of 500 or 600 persons, a meeting, and some good vocal and instrumental music. The Institution is throughout plainly, but substantially and neatly finished. There is a large lecture hall, with a platform, well lighted and ventilated, and excellently adapted for music, a library and newsroom, airy class rooms, and every accommodation for a considerable increase of members. The chair was taken by Mr. Joseph Ashworth, the president; and amongst those upon the platform were Stephen Heelis, Esq., mayor of Salford; Messrs. Thomas Bazley, James Heywood, and Oliver Heywood; Messrs. Thomas Ashworth, G. B. Birks, Wright Turner, C. Nichols, J. Fraser (the architect), and J. Hankinson, members of the Salford council; the Revs. A. E. Pearce and J. S. Hill; Messrs. Wm. Ashworth, W. Hill, David Chadwick, Elijah Armitage, Joseph J. Armitage, Samuel Armitage, David Morris (hon. sec. of the Union of Mechanics' Institutions), John Urquhart (hon. sec. of the Salford Mechanics' Institution), Peter Spence, John Aldred, &c. After the national anthem had been sung, the Chairman gave a sketch of the progress of the Institution, from the commencement of a small improvement society, formed by some working men, meeting in a cottage. To this society he was invited to pay a visit, and seeing the *nucleus* of a Mechanics' Institution, he suggested that one should be commenced. The idea was taken up, and steps at once originated for carrying it out. Subsequently, premises were rented in Broad-street, which were more commodious than the old ones, although not adapted for the purpose. A house-to-house canvass in the neighbourhood showed the necessity for perseverance; and some time afterwards a canvass was commenced for subscriptions for a new building. Sir Elkanah Armitage promised £100 provided the Institution did not get into debt; another £100 came from Sir John and Mr. T. B. Potter; Sir Benjamin Heywood gave £50; and up to 1854, when the war interfered, £400 or £500 had been raised. By the end of 1855 the subscriptions reached £950; during 1856 they were increased to £1,177; and now the Committee had been promised £1,420, of which only £55 remained unpaid. The Institution was not quite finished, and a gymnasium and other things were to be supplied. The building would cost about £1,200, and the fittings from £200 to £300; so that when £100 more had been raised, the Institution would be really free from debt. Towards the subscriptions the working classes of the neighbourhood had given about £70. The Chairman dwelt upon the need of such an Institution for Pendleton and Charlestown; upon the good it was calculated to accomplish; and he concluded by stating that letters of apology for non-attendance had been received from Lords Stanley and Goderich; Sir John Potter; J. A. Turner, Esq.; and W. N. Massey, Esq., Members of Parliament, and from Mr. Cobden. The Mayor moved a vote of thanks to the subscribers to the building fund. Mr. James Heywood seconded the motion, and it was agreed to unanimously. Mr. T. Bazley moved, and Mr. O. Heywood seconded, a resolution declaring the good results of Mechanics' Institutions; and several other addresses were delivered, the proceedings being enlivened by music.

Redhill.—The third annual report of the Redhill Institution shows a considerable improvement in the number of subscribers, and also that a more extensive use has been made of it by those members whose special interest it is calculated to promote. The number at present subscribing is 140, being a net increase of 31 upon the number at the close of last year. A musical entertainment, two poetic readings, and fifteen lectures have been given during the year—nine gratuitously; the remaining nine at an expense to the Institution of about £25. The lectures were as follows:—"Moore's Melodies and Shakspeare's Songs," Mr. Geo. Barker; "On the Brain and its Diseases," Mr. Jas. Runtz; "Popular Proverbs," Mr. G. Dawson; "Oliver Cromwell," Mr. W. Froy; "British Wild Flowers" (gratis), Dr. Headland; "Shakspeare's 'Merchant of Venice'" (read gratuitously), Mr. Oulton; "Light" (gratis), Rev. W. Pyne; "Literary History of the Scriptures" (two, gratis), Mr. F. Nalder; "Wit and Humour," Mr. G. Grossmith; "Ballad Poetry" (read gratuitously), Mr. G. G. Richardson; "Lecturing," Mr. G. Grossmith; "The Geology of Surrey" (gratis), Mr. J. R. Pattison; "Prison Discipline" (gratis), Rev. J. Hoare; "Australia and her Gold Fields," Mr. W. Froy; "Milton, the greatness of his character and genius," Dr. Daniel; "Pickings from Pickwick," Mr. G. Grossmith; "The Deal Ball Drop, and kindred subjects" (gratis), Mr. C. V. Walker. The library now contains 470 vols., 120 of which, by gift and purchase, have been added during the year. The average number of books issued monthly is about 70. The drawing class (suspended last year for want of a teacher) Mr. Wesley has kindly offered to take under his direction, and has also lent for the use of the members a valuable set of drawing models. The elementary classes for reading, writing, arithmetic, bookkeeping, and mensuration, are attended by fourteen members, under the direction of the secretary, G. Holden. Classes have also been formed for the teaching and practice of music. The committee remind members that those gentlemen who superintend these classes do so gratuitously, desiring to promote the interests of the Institution, and feel it the highest reward for their services to see the advantages thus offered fully appreciated; a proof of which can only be manifested by punctuality and attention. It is worthy of remark that the greater number of members admitted this year was principally in consequence of the formation of the above classes being announced. The following gentlemen have been elected officers and committee for 1857:—*President*—W. Klein, Esq.; *Vice Presidents*—W. Hackblock, Esq., N. Wilkinson, Esq.; *Committee of Management*—Mr. Fredk. Allwork, Mr. Wm. Carr, Mr. R. C. Carrington, Mr. C. Davidson, Mr. H. Fowle, Mr. H. L. Glascock, Mr. E. Hooper, Rev. W. Kelk, Mr. W. Rowney, Mr. W. Sanders, Mr. R. Turner, Mr. H. Wesley; *Treasurer*—Mr. J. Searle; *Secretary and Librarian*—Geo. Holden.

To Correspondents.

A letter from "Pyracesta" has been received, but cannot be inserted unless the name and address of the author be sent to the Editor.

MEETINGS FOR THE ENSUING WEEK.

MON. Geographical, $8\frac{1}{2}$. I. General Jochmus, "On the Battle of Sellasia, Marathon, and Thermus." II. Captain Spratt, "Remarks on Serpent Island." III. Professor Paul Chaix, "On the Hydrography of the Valley of the Arve." IV. Mr. H. C. Caldwell, "On the Exploration of Darien."
TUES. Royal Inst., 3. Dr. J. P. Lacaita, LL.D., "On Italian Literature—the Arcadia—Parini—Alfieri—Leopardi."
Syro-Egyptian, $7\frac{1}{2}$. I. Mr. Sharpe, "On some of the Egyptian Monuments in the British Museum." II. Mr. Bonomi, "On the Identification of certain figures on the walls of Khorsabad with certain personages of Scripture."
Med. and Chirurg., $8\frac{1}{2}$.
Zoological, 9.
WED. Literary Fund, 3.
Royal Soc. Lit., $4\frac{1}{2}$.
Microscopical, 8.
Archæological Association, $8\frac{1}{2}$.
Ethnological, $8\frac{1}{2}$.
THURS. Royal Inst., 3. Prof. J. Tyndall, "On Sound, and some associated phenomena."
Philosophical Club, $5\frac{1}{2}$.
Antiquaries, 8.
FRI. Astronomical, 8.
Royal Inst., $8\frac{1}{2}$. Prof. Faraday, "On the relations of Gold to Light."
SAT. Royal Botanic, $3\frac{3}{4}$.

PARLIAMENTARY REPORTS.

SESSIONAL PRINTED PAPERS.

PAR. No.

Delivered on May 26, 27, *and* 28.

48. Danish Transit Dues—Papers.
49. Trade and Navigation Accounts (30th April, 1857).
53. Railway and Canal Bills—3rd Report from the General Committee.
74. Committee of Selection—5th Report.
39. Revenue Departments—Estimates.
34. Shipping—Returns.
43. East India (Bengal—Memorial of Missionaries)—Return.
45. Ceylon—Copy of a letter.
2. Harbour, &c., Bills—Board of Trade Reports (22); Rivers Thames and Medway Conservancy.
26. Local Acts—Admiralty Reports: (35), Banff, Portsoy, and Strathisla Railway; (36), Victoria (London) Docks; (37), Milford Improvement; (38), Pulteney Town Harbour; (39*), Eastern Counties Railway (Pitsea and Burnham Branches); (40), Lowestoft and Burgh Saint Peter Ferry and Roads.

PATENT LAW AMENDMENT ACT.

APPLICATIONS FOR PATENTS AND PROTECTION ALLOWED.

[*From Gazette, May* 29.]

Dated 3rd February, 1857.

316. Julian Bernard, Albany, Piccadilly—Improvements in fastenings for uniting wood, metal, cloth, leather, and other materials.

Dated 6th February, 1857.

338. Henry Myers, 52, Rathbone-place, Charles Askew, 27½, Charles-street, Hampstead-road, and John Askew, 27, Charles-street, Hampstead-road—Improvements in railway and other breaks, and communicator between the guard and driver of railway carriages.

Dated 11th April, 1857.

1022. John Blythe Robinson, Beverley, Yorkshire—Improvements in machinery or apparatus for effecting agricultural operations.

Dated 16th April, 1857.

1078. Thomas Layzell Scowen, Allen-road, Stoke Newington—The horizontal fin-expanding-canopy for carriages, boats, and places.

Dated 25th April, 1857.

1173. Charles Thomas Robert Prynn, Newton Abbot, Devonshire—An improved apparatus to be used for totally or partially benumbing any part of the human frame previous to a surgical operation, for the purpose of performing the said operations without pain.

Dated 29th April, 1857.

1201. Joseph Haythorne Reed, Charles-street, Berkeley-square—Improvements in propelling ships or vessels.

Dated 30th April, 1857.

1211. Frederick Walton, Haughton Dale Mills, near Manchester—Certain improvements in the manufacture of plastic compositions.

Dated 1st May, 1857.

1288. Pierre Alexandre Barteau, Gabriel Guy, and Charles Corroy, Paris—Improvements in the production of artificial stone.
1230. John Ratcliffe, Blackburn, Lancashire—Improvements in preparing, or in machinery for preparing, yarns or threads for weaving.
1232. Alfred A. Blandy, M.D., D.D.S., Baltimore, U.S.—An improved mode of moulding and casting the plates or bases of artificial teeth.

Dated 2nd May, 1857.

1234. Samuel Hilton, Albion-street, Bethnal-green—Certain improvements in furnaces.
1236. Alfred Augustus De Reginald Hely, Oxford-street—Certain improvements applicable in the burning of gas.
1237. Prime Raban Jones, 22, Clapham-rise—An improved composition for the purpose of curing or preventing the scab in sheep and lambs, which will also greatly promote the growth of the wool, and destroy ticks, lice, and other vermin or impurities, keep the skin clean and healthy, and cure the mange in horses, dogs, and other animals.
1238. Henry Levy, High-street, Sheffield—Improvements in moleskins, velveteens, cords, and such like materials.
1240. Alexander John Paterson, Edinburgh—An improved method of constructing and propelling vessels.
1242. Joseph Seelie Greenhow, Chelmsford—An improvement in alarum apparatus when using electric currents.
1244. Benjamin Chew Tilghman, Philadelphia, U.S.—Improvements in treating fatty and oily substances.
1246. William Edward Wiley, 34, Great Hampton-street, Birmingham—Improvements in boxes or cases for containing needles, leads for pencils, pens, and other articles.
1248. Peter Fairbairn, Leeds, and Thomas Marsden, Broughton, near Manchester—Improvements in machinery for heckling flax, hemp, tow, and other fibrous materials.

Dated 4th May, 1857.

1250. John Fox, Preston—Improvements in the music scale, and musical instruments.
1251. Agostino Gatti, 20, Coppice-row, Clerkenwell—Improvements in the making of all kinds of seeds, buds, and fruits, for artificial flowers and fruits.
1252. John Stanley, 244, Whitechapel-road—Improvements in the construction and mode of applying cranes and other hoisting machines, to hoisting, suspending, lowering, and weighing purposes, also in generating, transmitting, and applying motive power for the same.
1254. Joseph Howard, jun., and William Howard, Market-place, Leek, Staffordshire—Improved apparatus for the manufacture of cheese.
1256. John Leslie, Conduit-street—Improvements in apparatus for ventilating buildings.
1258. John Thomas Way, Welbeck-street—Improvements in obtaining light by electricity, and in employing light so obtained for lighthouses, and for giving signals.
1260. Jules Alexandre Petiet, 34, Rue Lafayette, Paris—Improvements in actuating railway breaks.
1262. Edward Davis, Leeds—An improved construction of pressure gauge.

Dated 6th May, 1857.

1276. Benjamin Hingley and Samuel Hingley, Cradley, Worcestershire—Improvements in anchors.
1278. Henry Tibbetts Ropes, Liverpool—Improvements in refrigerators or portable ice-houses. (A communication.)
1280. Henry Hogarth, 1A, Adelphi-terrace, Strand—An improved apparatus for raising and floating vessels or other heavy bodies.
1282. George Tomlinson Bousfield, Loughborough-park, Brixton—Improvements in machinery for pulverizing clay and other substances. (A communication.)
1283. William Edward Newton, 66, Chancery-lane—Improved machinery for manufacturing paper, part of which is applicable to other purposes. (A communication.)
1284. William Edward Newton, 66, Chancery-lane—Improvements in locks for doors, safes, and other purposes. (A communication.)

Dated 7th May, 1857.

1288. Herbert Mackworth, Clifton—Improvements in the classification, preparation, and treatment of mineral substances, coke, and furnace cinders, and in removing and depositing such substances, and in machinery and apparatus for such purposes.
1290. Richard Bennett, Redditch, Worcester—A new or improved method of papering needles, or making up needles for sale.
1294. Charles Tilston Bright, Harrow, and Charles De Bergue, Dowgate-hill—Improvements in apparatus to be employed in the laying or sinking of submarine telegraph cables.
1296. Louis Charles Dolléans, Paris—Improvements in ornamenting porcelain, china, opal-glass, and similar products by lithographic chromo-lithographic printing and gilding.
1298. John Crawford, Glasgow—Improvements in heating and cooking apparatus.
1300. William Colborne Cambridge, Bristol—Improved machinery for winnowing corn and separating seeds.

Dated 8th May, 1857.

1301. Frederick Grindlay Howard Woodward, 3, Horatio-terrace, Trafalgar-road, Old Kent-road—Medicine for the cure of dropsy.

1304. Theodore Lipkan, 39, Rue de l'Echiquier, Paris—An improved anti-syphilitic compound.
1305. Joseph William Schlesinger, the Grove, South Lambeth—Improvements in the backs and covers of account books and other books. (A communication.)
1306. Louis Heinemann and Arnold Heinemann, Manchester—Improvements in waterproofing woven fabrics and fibrous materials.

Dated 9th May, 1857.

1308. George Heppell, Uttoxeter, Staffordshire—Improvements in ventilating mines and such like places.
1310. John Henry Francis, 53, Ossulston street, St. Pancras, and Robert Ord, Morpeth-cottage, East-street, Islington—Improvements in the means and apparatus employed for cleaning casks.
1312. John Saxon Maccarthy, Newman-street, Oxford-street—Improvements in driving or ramming paving blocks and other surfaces.
1314. Andrew Peddie How, Mark-lane—Improvements in circular brushes for sweeping boiler and other tubes.
1316. Henry Hobbs, Cambridge-street, St. Pancras, and Edward Easton, the Grove, Southwark—An improved mode of preventing the incrustation of steam boilers.

Dated 11th May, 1857.

1317. Robert Wilson, Patricroft, near Manchester—Improvements in machinery or apparatus for raising or forcing fluids.
1318. James John Myers, 17, Bugle-street, Southampton—A new method of regulating paper laid on to be printed on one or both sides, at and by cylinder printing machines, by means of guides, whereby the present waste of paper in progress of printing is avoided.
1319. Alfred Dawson, 14, Barnes-place, Mile-end-road—An improved wrought-iron cock, suitable for water, steam, or gas.
1320. Charles William Siemens, John-street, Adelphi—Improvements in furnaces, and in the application of heated currents.
1321. John Miller, New Lanark, N.B.—Improvements in oil cans or apparatus for lubricating machinery.
1322. John Miller, New Lanark, N.B.—Improvements in water meters.
1323. William Geddes Borron, Glasgow—Improvements in closing or stoppering bottles, jars, and other receptacles.
1324. John Davies Mucklow, Blackford-bridge, Lancashire—Certain improvements in the manufacture of rollers or cylinders to be employed for printing calico and other surfaces.
1325. Richard Fitton and Samuel Hall, Oldham—Certain improvements in machinery or apparatus for spinning cotton and other fibrous substances.
1326. Samuel Hallett, Clarges-street, Piccadilly—Improvements in pianofortes. (A communication.)
1327. Alfred Vincent Newton, 66, Chancery-lane—Improved machinery for cutting veneers. (A communication.)
1329. Richard Archibald Brooman, 166, Fleet-street—An improved locomotive apparatus for rail and ordinary roads. (A communication.)

Dated 12th May, 1857.

1332. Claude Antoine Buisson, Paris—Improvements in rotary engines.
1334. John Westlake, Helston, Cornwall—Improvements in cleaning, separating, and dressing ores of pulverised tin, copper, lead, silver, and other minerals, ores, and substances.
1336. William Henry Barlow, Derby, and William Hemingway Mills, Great George-street, Westminster—Improvements in the permanent ways of railways.
1338. Julien Charles Dubois, 63, Rue de Cherche Midi, Paris—Improvements in castors.
1340. John Richard Cochrane, Glasgow—Improvements in the treatment or manufacture of ornamental fabrics.

Dated 13th May, 1857.

1344. Thomas Briggs, 173, Woodhouse-lane, Leeds, and John Starkey, 12, Parker-street, Liverpool—Improvements in machines for washing, wringing, and mangling.
1346. William Wolfe Bonney, Fulham—A chemical composition or agent to be employed in lieu of, or to be substituted for, argol, tartar, and tartaric acid. (A communication.)
1348. Henry Tolkien and Joseph Middleton, Finsbury—Improvements in pianofortes.
1350. Robert Stirling Newall, Gateshead—Improvements in the manufacture of wire strands for electrical purposes.
1352. Nathan Ager, Upper Ebury-street, Pimlico—Improvements in connecting spindles of locks and latches with their knobs and handles.
1354. Michael Henry, 77, Fleet-street—Improvements in winding weft, and in the machinery employed therein, part of which is applicable to spinning machinery. (A communication.)
1356. William Adams Alderton, Brighton—Improvements in spindles for door locks, latches, and other similar purposes.

Dated 14th May, 1857.

1358. Valentin Sauerbrey, Basle, Switzerland—Improvements in the manufacture of fire-arms.
1360. William Ashby, Croydon—Improvements in water wheels.
1362. David Hesse and Max Hesse, Manchester—Certain improvements in the manufacture of shirts, shirt fronts, and other articles of wearing apparel.
1364. James Stevenson, Jun., Glasgow—Improvements in lighting apartments and passages.
1366. James Sharrocks, Lower Healey, near Rochdale—Improvements in machinery or apparatus for pressing bricks, tiles, and other plastic substances.
1368. John Carr, Killyleagh, Ireland—Improvements in machinery for hackling flax, hemp, and other fibrous substances.

Dated 15th May, 1857.

1370. Joseph Aizlewood, Baths Foundry, Rotherham—Improvements in hat and umbrella stands.
1372. William Hartley King, Netherend, near Stourbridge—Improvements in kilns and stoves.
1374. Robert Porter Walker, New York, U.S.—Improvements in machinery for hulling and scouring coffee and similar substances.
1378. Edward Gripper, Winchester wharf, Bankside—Improved machinery or apparatus for washing, drying, and cleansing corn, seed, Egyptian beans, or other pulse.
1380. William Marriott and David Sugden, Huddersfield—Improvements in heating press plates for pressing woollen, worsted, cotton, silk, or other fabrics, paper, and other articles.
1382. Richard Archibald Brooman, 166, Fleet-street—Improvements in machinery to be employed in the refining of sugar. (A communication.)
1384. Henry Brown, 137, Whitechapel-road—An improved material resembling ivory.

Invention with complete Specification Filed.

1419. George Sharp and William Elder, Jarrow, Durham—Improvements in steam hammers and machinery for forging iron and other substances.—20th May, 1857.

WEEKLY LIST OF PATENTS SEALED.

May 29th.

2825. James Dryden.
2832. Richard Harmer.
2836. John Gedge.
2837. John Gedge.
2838. John Coope Haddan.
2839. John Gibson.
2849. John Longbottom.
2853. Richard Archibald Brooman.
2865. Emory Rider.
2866. Thomas Crabtree.
2867. Adam Bullough and Wm. Bullough.
2870. Joseph Deeley.
2886. Henry Moore.
2918. Anne Marie Macé.
2930. John Cornes.
2950. John Turner Wright and Edwin Payton Wright.
2952. Edward Paton and Charles Frederick Walsh.
2954. Henry Wimball.
2956. James Hartas Headley.
2960. George Sherwin.
2990. Frederick Levick, jun., and John James.
3004. François Donny.
3016. George Alexander Harrisson.
3044. James Lark.
3075. Richard Reeves Cox.
3084. Isaac Atkin and Marmaduke Miller.
3092. Jean Louis Celestin le François de Grainville.
62. Henry Charles Hill.
440. John Cruikshank.
698. William Charles Day.

June 2nd.

2858. Matthew Townsend.
2868. Henry Genhart.
2871. James Kinder Cheetham.
2874. James Apperly and William Clissold.
2915. Thomas Vicars, sen., Thomas Vicars, jun., Thomas Ashmore, and Jas. Smith.
2961. George Tomlinson Bousfield.
2985. John Smith.
3015. Thomas White.
3039. James Robertson Dick.
3065. William Irlam.
5. Eugène Theodore Noualhier and Jean Baptiste Prévost.
557. Moses Haym Picciotto.
889. George Lauder and Thomas Ireland.
959. George Tomlinson Bousfield.
961. Samuel Clarke.
963. Alfred Vincent Newton.

Patents on which the Stamp Duty of £50 has been Paid.

May 21st.

1129. Robert Crosland, William Holiday, and John Heaton.

May 27th.

1228. Isaac Taylor.

May 28th.

1185. Henry Kraut.
1191. Joseph Ridsdale.
1222. Thomas Greenshields.
1225. Edward Orange Wildman Whitehouse.

May 29th.

1416. William Morgan.

May 30th.

1205. George Alfred de Penning.
1215. Charles King and Edward Sutton Benfield.
1216. Walter Westrup.
1224. Benjamin O'Neale Stratford, Earl of Aldborough.

WEEKLY LIST OF DESIGNS FOR ARTICLES OF UTILITY REGISTERED.

No. in the Register.	Date of Registration.	Title.	Proprietors' Name.	Address.
3993	May 28.	A Parcels Mould	G. V. Ball	Banbury.
3994	June 2.	Needle Case or Holder	Henry Milward and Sons	Redditch.

Journal of the Society of Arts.

FRIDAY, JUNE 12, 1857.

NOTICE TO MEMBERS AND INSTITUTIONS.

The prizes awarded by the Society's Examiners to the successful Candidates at the June Examination in London will be distributed on the morning of Tuesday, the 23rd of June, at the Society's House in the Adelphi.

The Society's Annual Dinner will take place at the Crystal Palace in the afternoon of the same day. Lord Stanley, M.P., will preside.

The Sixth Annual Conference of the Representatives from Institutions in Union with the Society, is appointed to be held at the Society's House on Wednesday the 24th of June.

The Annual General Meeting for receiving the report of the Council and the Treasurer's statement of receipts, payments, and expenditure during the past year, and also for the Election of Officers, will, in accordance with the Bye-Laws, take place at 4 o'clock on the same day.

ART-TREASURES EXHIBITION.

The period fixed for the Society's visit to the Manchester Art-Treasures Exhibition, is the week commencing the 3rd August.

A Local Committee has been formed in Manchester to make arrangements for the Society's reception there.

That Committee is desirous of knowing, as early as possible, the number of members likely to visit Manchester, in order that information respecting hotels and lodgings may be obtained.

The Committee are making application to the principal Societies, the Exchange, and various large manufacturers, for the admission of members of the Society of Arts, during their visit, on showing their cards of membership.

NOTICE TO INSTITUTIONS.

The Bill prepared by the Society's Committee to amend the 6th and 7th Vic., Cap. 36, for exempting Literary and Scientific Institutions from local rates, has been brought into the House of Commons by Mr. Hutt, M.P., was read a second time on Wednesday last, and stands committed for Wednesday, the 24th of June. As applications have been made by many Institutions for a form of petition to be presented to the House of Commons in its favour, the following has been drawn up for that purpose:—

To the Honourable the Commons of Great Britain and Ireland in Parliament assembled.

The Humble Petition of the undersigned Members of
[Insert name of Institution],

Sheweth,

That a Bill has been introduced into and is now before your Honourable House, for the purposes of amending an Act of Parliament passed in the 6th and 7th years of the reign of Her present Majesty Queen Victoria, cap. 36, intituled "An Act to Exempt from County, Borough, Parochial, and other Rates, Lands and Buildings occupied by Scientific and Literary Societies."

That by the decisions of the Courts of Law the operation of the said Act is extremely limited, and there are many "Societies instituted for purposes of Science, Literature, and the Fine Arts," which, by reason of such decisions, are excluded from the benefit of the said Act.

That the privilege granted by the said Act ought to be extended so as to include any Society instituted for purposes of Science, Literature, Education, or the Arts, so long as "such Society shall be supported wholly or in part by annual voluntary contributions, and shall not, and by its laws may not, make any dividend, gift, donation, or bonus in money, unto or between any of its members."

That the Bill now before your Honourable House, above referred to, will, in the opinion of your petitioners, satisfactorily accomplish that object.

Your Petitioners, therefore, humbly pray that the above-mentioned Bill may be passed into a law. And your petitioners will ever pray, &c.

The petition must be *wholly written* on paper or parchment, and if several sheets are necessary they may be fastened together, but, in that case, one signature at least must be attached to the sheet on which the petition is written. The petition may be either by the "undersigned members" of the Institution or by the "undersigned member of the Managing Committee" of the Institution. The petition, when signed, should be sent to the Local Member of Parliament for presentation, with a request that he will support the prayer of the petition.

REPORT OF THE COMMISSIONERS FOR THE DIRECTION OF TRIAL WORKS AT PARIS, FOR THE APPLICATION OF SEWER OR LIQUEFIED MANURE TO PURPOSES OF AGRICULTURE.

(Communicated by Mr. Edwin Chadwick.)

In submitting to the Society what I think will be deemed by disinterested persons an important report, I beg leave, in the way of explanation, to recall some of its antecedents, most of which will be in the recollection of Dr. Booth, the chairman of the Council, and others of the members of the Society, who went as a deputation to the Emperor of the French on the occasion of the presentation of our address.

Being one of the international jury at the great Exposition there, charged with the class of subjects in relation to Hygiene, and being also named as one of a special committee of the Society of Arts to examine and report on the new works recently constructed there, and to point out which of them might be recommended as applicable to London, without undervaluing the new architectural and decorative arts, I thought I should best be enabled to meet the inquiries of my colleagues of th section in Hygiene, and best aid the Society's miss by examining the works beneath the new surface tures, by looking at the condition of the poorer districts, and at the new works professedly for the sanitary relief of the population. With the Engineer in Chief, with whom I was put in communication, I descended into and examined the latest and the largest new sewer, the Sewer Sebastopol, and I saw there constructions such as many of those recently executed in London, though not quite so unskilfully, such as the great Victoria-street sewer, works of certain enormous cost, and probable good profit to the constructors, but, as I considered, of no equivalent benefit to the population of the houses by which they passed,—and this was a matter of actual experience—works even of probable injury from the increase of foul gaseous evaporations, and of very certain grievous additions to the local taxation. Within the metropolis generally the air of the houses was fœtid, there being a constant waste by decomposition and evaporation of materials of the richest productive power, the immediate and constant removal, and direct application of which would give to the adjacent land the aid and fertility of which it is susceptible and in need; and the extent of the need of the agriculture there may be judged of by the fact reported on examination and verified by agriculturists, that, with all the advantages of soil and climate, the yield of wheat in the department of the Seine, and indeed throughout France, does not average more than thirteen bushels an acre, that is to say, about one-half of that old ordinary yield which my friend Mr. Mechi, and others, are denouncing, and by crops of fifteen bushels an acre and more, are proving to be *en arrière*, and discreditable to our agriculture in England. Now, as to the means of relieving the population from the oppression of the noxious evaporation from wasting manure pervading their habitations, which, in its effect, is far more dire than any political oppression to which they can be subjected. In my report of 1842, on the general sanitary condition of the population of Great Britain, I held forth that what, addressing agriculturists, I must call the accumulation and waste of manure within habitations might be prevented,—that for the reservoirs which accumulate it, cesspools, house drains of deposit, and sewers of deposit, which are only extended cesspools, self-cleansing soil pan apparatus and tubular drains might be substituted, at a less annual rate of expense than farmers even could fetch the manure and empty the cesspools, and at an expense less than that of annually cleansing the cesspools and the sewers of deposit, and of removing annually by any means the residue of that manure,—two-thirds of the fertilising matter of which, according to chemical evidence, is now wasted by its retention during the year amidst habitations. In the large blocks of buildings, old as well as new, that promise has been realised, and it is now in the course of realisation in nearly one hundred of our provincial towns, at a rate indicated by the manufacture of tubular branch sewers and house drains, of which fifty miles a week are made at Lambeth,—each mile serving, as far as I can estimate, for between one and two thousand of population. On a view of the conditions and constructions at Paris, I entertained an equally strong conviction that the enormous waste of manure smelt within the city might be prevented, and its complete and immediate removal and the relief of the population effected by the like self-acting constructions, at less than the annual charge of cleansing the cesspools and removing the wasted residue which, I was told upon official authority, was four millions of francs per annum; we may say about four francs per head of the population. Undoubtedly, the work of the immediate removal of the manure in the state best fitted for its immediate application is generally accomplished by our new works for a less expense than that.

It will be in the recollection of those present on the occasion of our deputation, that after the answer to our address had been given, his Majesty did me the honour to ask me my opinion of the new works in progress in Paris. I deemed it my duty to declare to him frankly, but respectfully, the facts as I found them; that, whilst all was fair above, all was foul beneath. I said this because, whilst from sixty to seventy per cent. of the houses in London have within them that poison pit, the cess-pool, in Paris the cess-pool system is universal, and maintained within private premises, and formed under aggravated conditions within the precincts of new and fine outside architectural constructions. I submitted, as worthy of his Majesty's notice, what has been done in the model dwellings in London, where epidemics have been almost entirely banished—as they have, indeed, in many of the common lodging houses and dwellings of old construction,—and the death-rates kept down steadily at thirteen in a thousand; the average death-rate in all London being about twenty-three in a thousand, whilst in all Paris, with the advantages of a superior position and climate, the death-rates are twenty-eight and thirty in a thousand; the excess in Paris being due, as I consider, chiefly, to the greater predominance of the cesspool and low sanitary conditions, offensively perceptible to the senses, even in the houses of the highest class, and which make some quarters of Paris positively uninhabitable to those who can get away at certain seasons of the year. On these facts I felt warranted in observing, as I did most sincerely and respectfully, that it had been said that Augustus found Rome of brick and left it of marble, but that his Majesty, the Emperor of the French, would do far more for his people, if, finding Paris stinking, he left it sweet. This I stated might be accomplished with the less difficulty, from the narrow area on which the population was massed, the houses being what I termed perpendicular streets. Paris, too, is most favourably situated for the immediate application of sewer or liquefied manure to agricultural production. I submitted to his notice, as deserving of special attention, the works in progress for the abolition of cess-pools in the greater number of those of the English towns which are under the Public Health Act; and one town in particular, where the question of the prevention of the pollution of rivers, and the application of sewage to agricultural production, the sanitary question, and the inoffensive utilisation of the manure, would, in disinterested unprejudiced and competent examination, be found to be practically resolved in a manner peculiarly applicable to the climate and much of the soil of France. His Majesty received these and representations to the like purport with that attention which he is well known to give to all measures that promise well for the improvement of the great mass of the population. I disclaimed any credit for my own partial recommendations of that system, of which Dr. Lyon Playfair (who was intimately conversant with its initiation), at the Society's meeting, where the subject was last discussed, declared me to to be the author; all I asked was, for the impartial examination of the works already in operation, by his Majesty's own competent officers. I, at the same time, submitted to his Majesty the new mode of culture as peculiarly suited to the small farms of France, and mentioned instances of a double and threefold production obtained on small farms in England of only twenty-five acres or ten hectares in extent. At a subsequent special audience, I presented to him Mr. G. H. Walker, the owner of the lands irrigated with the sewage of Rugby, that his Majesty might put his own questions on the important operations conducted there, as he did most closely, when he appeared to be somewhat surprised by the assurance of the new and comparatively inoffensive condition in which the sewage was now discharged from the new tubular sewers and drains from the houses of that town where all cesspools are abolished, and of the entire inoffensiveness of the application of the fertilising matter to the lands in the immediate vicinity of dwellings. The prefect of the Seine was present at the audience, and he showed that the examination of the new English works, which

I recommended, had not been neglected; and it appeared that although those works were only in partial operation at the time the examinations were made, the reports were highly favourable. I found, indeed, that the forms in operation in England, under the system of liquefied manure cultivation which I have promoted, had been examined by Mons. Leonce de la Vergne, by Professor Moll, and by others, and that the principle of culture, as well as the practice, had their emphatic confirmation and recommendation for adoption, as well as that of Count Gasparin, the most scientific agriculturist perhaps in Europe. Under these circumstances I recommended the adoption of trial works, near Paris itself, that French agriculturists might form their own opinions on visible experience, and this measure was approved. The prefect, however, objected owing to the practical difficulty of obtaining land for any extent of trial in the immediate vicinity of Paris. Having paced some of the ramparts, the earthworks of which comprehend, as I guessed, more than a thousand acres, I pointed them out as being eligible for the purpose or as better than none; and, such as they were, I ventured to promise that on the principle of culture I proposed, the milk of at least one additional cow per acre might be obtained for the use of Paris. On the motion of M. Dumas, the eminent chemist, and member of the Institute, a sum of money for the trial works was voted by the Municipal Council, and the direction of the trials was confided to Professor Moll, the director of Conservatoire des Arts et Métiers, at Paris, himself a practical agriculturist, and the writer of an elementary treatise, which is popular in Belgium as well as in France, and to Mons. Mille, Engineer-in-Chief of the Ponts et Chaussées. It is the first report of these Commissioners which I now submit, and I do so believing it to be of peculiar interest on account of the application of town manures to a wide range of culture, including many plants, to which, so far as I am aware, its application has not before been made or observed.

I must, however, premise further, that the manure applied in the trial works at Paris, though comprising the matters chiefly discharged in sewers, was not in the condition which I have contemplated as sewer manure; it being old, and, therefore, decomposed manure, taken from the cesspools where it has been retained for weeks and months, and often beyond a year, during which time it has undergone a greater or less extent of decomposition,—the products of which have escaped in houses and streets, to the pollution of the air breathed by the inhabitants, and to the loss of fertilising matter. Now we have ascertained one important fact, that the injurious and offensive stage of decomposition only begins, however, in about four days; but in the towns drained on the new system of self-cleansing tubular house drains and tubular sewers,—when they are properly laid and adjusted to the flow,—there is no deposit; everything is received in cold water, and this arrests decomposition. Under ordinary circumstances, at Rugby for example, where the sewer manure is applied to one part or the other of the land during three hundred days in the year, it is removed from beneath the site of the town within an hour, and within another hour it is in the soil, and is there, not in mechanical suspension, but in chemical combination,—in which condition it is retained through the winter rains, and snows, and frosts, until it is taken out by the action of vegetation. The Report runs as follows:—

"The municipal authorities have granted a sum of 20,000 francs (£800) to carry on experiments on the direct application of cesspool or sewer manure to farm cultivation, and the Prefect at the zealous instance of M. Dumas, (the celebrated chemist and member of the Institute,) confided the direction of the experiment to us. The object was to encourage amongst the farmers near Paris, the use of the Flemish method of irrigation from the water cart, to try upon the grass on the earthwork of the fortifications the more advanced methods of English agriculture by pipe distribution, and to determine, by comparison (at the dépôt), what are the effects of such liquefied manure on different species of plants.

"We now proceed to submit the results of our trials, and we will follow the order of the programme, following the course of the conduit of Bondy, which is the axis of our distribution, we first proceed to the extremity, to inspect the effect of the new cultivation on private farms which we had wished to develop. We shall then return to the fortifications, to examine the alterations produced by the new system of pipe distribution, and lastly, to the dépôt, where the study has been followed as closely as in a laboratory; we shall then discuss the facts which appear to result from the application of cesspool or sewer manure to more than 40 species, cereals, root crops, grasses, and industrial plants, &c.,

"As to the trial works on private farms, at first, in order to overcome the old habits or routine of the farmers, it was necessary not only to deliver the manure gratuitously, but also to lend the water carts with which the manure was distributed. Very soon, however, the example spread, and the carts were much sought after and became scarce. The farmers were warned that the vehicles would soon be called in, and that they must furnish their own carts. A farmer of Sevran Moreau had the courage to begin. By degrees 35 farmers of Bondy, Nonneville, Levry, &c., followed his example. Some bought proper irrigating carts, others procured old wine casks, mounted them on wheels, and adapted to them an economical distributor placed just below the tap. They came a distance of six miles to fetch the manure from Bondy. But the distance rendered the transport of the manure by carts, both insufficient and slow. A farmer of Vaujours (Mr. Penon) adopted a more efficient and convenient method. He took one of the canal boats of the Ourcq, covered it with a deck, and had it pitched over with bitumen, and in this state sent it to receive a load of the liquefied manure at the tap of the dépôt. In one night 40 cubic metres of manure were brought to him at Vaujours. The distribution could thus be extended from the canal, over the whole valley. After having established a sort of commercial fountain at Bondy for the supply of the irrigating carts, a supply pipe with tap was opened upon the canal, to which boats could come, and so avoid the loss of time in going from La Villette to Bondy. This was not all; if liquid manure could circulate by conduits and covered boats, the solid manures could be sent by the railroad. The Richer Company, (the chief company, which possesses the monopoly of emptying cesspools at Paris) rendered us every assistance. They had already sent a waggon to the Imperial domain of Lamotte Beuvron. They had to forward some waggons to Beance, near Toury, for M. Marchand, and to Etampes for a market gardener. The Orleans railway lent itself to our plans, and granted us conveyance at the lowest scale of charges. The Eastern line acted in the same manner. Champagne did its share of the distribution of the manure. Mr. Jacquesson, of Chalons, a man of great ability and enterprise, entered into our views, and in order to receive the liquefied manure brought to him by the railroad, constructed cisterns, &c., at his own expense, to the value of 20,000fr. If we had not been stopped by the difficulty in obtaining a manure in casks distinct from those which are required for the business of Vidange, and if the transport to great distances could be organised, so that the barrels filled each night in the different quarters of Paris could be sent constantly to the Gare railway station, we should have obtained immediately great demands for the fertiliser.

"As it is, with all the resistance of ancient habits and customs, we have already reached a delivery of 6,000 cubic metres, or 6,000 loads, equal to 7,848 cube yards. The demand went on increasing till July it ceased at the hay harvest, and it revived only feebly in autumn, as the farmers employ their horses in working and carting the accustomed solid manure.

"Manure has been distributed on an average about 25^{m3},* 32⅔ cube yards the hectare; the hectare being 2·4712 acres, or near 2½ statute acres; say ten horse loads the acre upon meadow and clover lands, on corn land that had been more or less poor, on land laid out for barley, oats, turnips, beetroots, and potatoes.

"It is to be borne in mind that the application was by an imperfect method. In consequence of the want of labourers knowing the use of the Flemish method, and willing to use it, the casks were merely taken into the fields and the tops opened to water the plants, as they water the streets of Paris; a very simple but imperfect method, as it does not allow an equal distribution of the fertiliser, and makes it impossible to manure the land when the crop has obtained a certain growth.

[In respect to the application of the manure by the Flemish method of the water cart, it is to be observed that by that method it is usually applied only in single dressings, each of which serves for one year, and it is usually in a high state of concentration; the expense of that method of application being such as to render repeated dressings of more diluted manure inexpedient, whereas by the method which I have proposed the manure is usually applied in three or four dressings; in some farms eight or ten dressings are common. Decomposing manure ought to be applied diluted with water to such an extent as to prevent all offensive smells. The expense of the distribution of manure by steam-power is usually less than one-sixteenth or one-twentieth the expense of applying it by the water cart; and with an eight or ten horse steam-engine one man and a boy will distribute as much manure in a given time as can be distributed by the manual labour of between one and two hundred men in the method most in use in Switzerland.—E. C.]

"Nevertheless, as in Flanders, the farmers have operated not only on the naked soil, but also on the springing crop. They neglected, however, to dig the ground afterwards, in order to mix the manure well with the land, and they did not take the precautions, so general in the north, to hoe and weed and earth up the plants; yet the results are remarkable. According to the declaration of the farmers themselves, who are well accustomed to such calculations, and who were little interested in the exaggeration of the efficiency of a manure, which they were to pay for in the following year, the increase of production has been from 15 to 40 per cent., and may be valued in money at an average of 150fr. per hectare, that is to say, £2 8s. the acre.

"This result will appear satisfactory if we take into consideration the imperfection of the methods, the inexperience of the farmers, and also that the application of the manure was risked only on poor land.

"AS TO THE TRIAL WORKS IN THE FORTIFICATIONS.

"At the fortifications we required the grass lands near the canal Ourcq, because they are traversed by the conduit of Bondy. But the renter of the grass of the earthwork of the fortifications, a cattle-feeder at Pantier, would not lend any of his land at any price, so much was he persuaded that the manure would infect and spoil the soil. The military authorities interfered, and the farmer consented to give up two hectares, nearly 5 statute acres, for a compensation of 650frs., or about £26. The mechanical arrangement for the distribution of the liquefied manure was very simple. A branch pipe of 0.068^{m} was fixed upon the conduit at Bondy, and was led to follow the direction of the bastion and the adjoining curtains. At every 40 metres or thereabouts, openings were made, to which were screwed a flaxen hose, which supplied through a jet about two litres a second, or $7^{m}50$ an hour. As the experiment depended entirely upon the special service of the conduit during the week, they could only have pure, *i.e.*, an undiluted, liquid manure, and it was necessary to wait till Saturday, the day of washing, to have the advantage of the diluted flow, and to obtain an irrigation distributed in a manner similar to rain.

"The land was all made-soil, the earthwork of the fortification being partly taken from the fosse, and consequently was very various in quality, and generally poor. The lightness of the soil suited the clover, which was sowed immediately on the works being completed, and succeeded generally. Ten years, however, had worn out the land, and such was the poverty of the soil, that the numerous slopes had not the least vegetation, and, not only did the production promise nothing, but it was feared the profile of the fortification would be injured. There was, then, a double reason for making experiments with the sewer manure, which could only be used, on the English method, on a slope so steep as that of the fortification.

"The surface of the two hectares was divided into strips, which were manured in different proportions in order to ascertain what proportion of manure acted on the crop.

"From the month of May, the irrigated portions presented the aspect of a meadow, the dark and vigorous green of which contrasted with the scanty and yellow vegetation of the unirrigated portions. The grass was cut for the first time in June, and the crop was abundant; the second crop was affected by the drought of July, and the third was retarded till October.

"After the cuttings there is still a thick grass on the irrigated portions, whilst on the unirrigated portions the land is thinly and poorly covered, or positively naked, presenting the appearance, on the face of the earthwork, of two soils and two climates.

"The farmer himself, struck with the change, did not wish to continue the letting of the land on the same terms; he recognised the fact that the manure not only increased the quantity but did not injure the quality of the crop.

"Table III. gives the amount of manure, and the crops obtained from each part experimented upon; the results are estimated in dried hay, at so much weight per hectare. It will at once be seen how much larger a quantity of manure has been used than on the ordinary plan. The farmers of the plain use scarcely 25^{m3} per hectare. In the north they do not exceed 40^{m3}. In England, where they have adopted irrigation with liquid manure, the quantity per hectare has been 57^{m3}, but here the dressings vary from 100^{m3} to 500^{m3}.

[The results on the chief species of culture by the farmers, appear from the tables to have been all in various rates of increase over the culture on the old plan by stable manure; thus wheat, lowest 25 per cent. of increase, highest 33, average increase 30; oats, lowest 20, highest 25, average 22; barley tried only in one farm, 38 per cent. of increase; turnips, lowest 25 per cent., highest 50, average 44; potatoes, 10, highest 50, average 24; beet-root, lowest 16, highest 50, average 26. The produce on the earthwork of the fortifications was, in the ordinary cultivation, at the rate of 2,800 kilogrammes, or 2 tons 15 cwt. 3lb. of hay per hectare; watered with 100 cubic metres or loads of liquefied manure, it was 4,950, or about 4 tons 17 cwt. 1 qr. 21 lb.; with 200 loads cubic metres, it was 7,100, about 7 tons; with 250 cubic metres, 8,960, or 8 tons 16 cwt. 1 qr. 15 lb.; with 350, it was 11,300, or 11 tons 2 cwt. 1 qr. 22lb.; with 400, it was 12,500, or 12 tons 6 cwt. 8 lb.; with 500, it was 12,800, or 15 tons 11 cwt., or in the highest result the produce stands at 12,800 kilogrammes, or 12 tons 11 cwt. per hectare, that is, a little over 5 tons per statute acre.—E.C.]

"It was one part of our experiment to carry the application of manure to the point of satiety, as it may be called, that is, till the increase of manure had no effect on the production. It will be seen that this limit is attained at 12,500 per hectare, beyond which the production remains the same. The poor soil, the inequality of the surface and the steepness of the slope, necessitated the use of a large quantity of manure in order to penetrate to the deep roots of the old plants; and, notwithstanding this high manuring, the clover showed very moderate effects from this irrigation; it was chiefly the grasses which came up spontaneously in the numerous spaces left by the old roots which formed the increased production.

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* 25 Cubic metres.

"The ground was so compact and hard that even in wet weather the manure could not penetrate beyond a small depth. It would have been different if we had been able to use the liquid manure diluted with four or six times its volume with water, as is the practice on the English liquefied manure farms, but here we were obliged to use almost pure manure. The only corrective to this defective method was after each dose of the concentrated manure to irrigate as soon as possible afterwards with pure water; that is, when it was a growing crop. In this manner, the bad effects of the contact with the sewage, which is itself corrosive, and is rendered more so by the mixture of salts of zinc which are used as a disinfectant, is diminished, if not entirely prevented. It has often happened, that after a dressing the clover has immediately been touched, it has become yellow, and even has disappeared entirely. A new vegetation replaced it, but only after some time, and under the influence of constant humidity.

"Our experiments would probably have succeeded better on the light and stony ground of the front of the fortification, perhaps, also, without any new irrigation, more striking effects will appear in the adjoining land, when the winter shall have broken up the crust of the soil, and the manure shall have circulated in it.

"But, in spite of these disadvantages, we have obtained a produce of 12,500 kilogrammes of dry hay from a land which in average years yielded not more than 3,000 kilogrammes. This irrigation has increased the crop fourfold.

"Calculating that one head of cattle consumes 4,000 kilogrammes of hay per annum, each hectare belonging to the military department, which is now insufficient for the feed of one beast, might easily be made to feed three, if the liquid manure system were organised. The surface belonging to this department amounts to more than 300 hectares, and therefore if this were well managed, such a space of land would be sufficient to feed a thousand cows. What an increase of resources for the population of Paris.

"The Trial Works at the Depot.

"We had at our disposal at the dépôt 30 *acres* of land, divided into bands along the walls, and a lawn which formed the principal part of a garden. Plots of ground were set out to try the effect of irrigation upon the chief agricultural plants, viz., grain, vegetables, roots and fodder. The lawn was more especially reserved for different kinds of green fodder, and chiefly for Italian rye grass, a plant the growth of which is much increased by manure, and which in England under the new liquefied manure culture yields enormous crops.

"The soil here also is a made soil, and has all the varieties which are usual in such places. One side which had been under garden culture was drained, and being traversed by a sewer, had a collecting outfall at hand. The other portions, being merely as it were levelled rubbish, were permeable, and therefore did not require draining. As to the distribution of the water and the manure, it was managed here in such a manner as to make the irrigations independent of each other if needed. A reservoir was erected on the roof of the adjacent building, about $5^{m}\ 50$ above the surface of the land. Two pipes opened into it, one from the conduit of Bondy, conveying the manure, the other being attached to the pump which supplied the establishment with water. The managers were by these means enabled to mix definite quantities of water and manure.

"From the tank was led a tube of $0.\ 068^{m}$, which was carried along the plots of ground and across the lawn, feeding the irrigating pipes, which were placed at intervals of from 30 to forty metres.

"The hose was made of flax, as at the fortifications; the jet pipe, or rose, which spread the liquid, diffused it at the rate of one litre per second, or 4^{m3} an hour. The drains being once established in the subsoil, the strips of land along the walls were divided into 40 compartments of about eight metres, each being divided into two equal plots; one part being given to the irrigation, the other left unirrigated, in order that the effect of the irrigation with liquid manure might be made evident at once from the contrast; for all the other circumstances were exactly alike in both, the digging, seeding, weedings, &c., being the same. The chief agricultural plants had their place in these plots. Thus, setting out from the end of the garden there were first the cereals, such at least as are sowed in the spring—oats, wheat, barley, rye, Indian corn, &c.; next vegetables, peas, haricot beans, French beans and cabbages; then the plants of commerce, such as flax, hemp, poppies, colza, and these were followed by the root crops, potatoes, Jerusalem artichokes, carrots, turnips, and beetroot; then a group of fodder plants, red and white clover, luzerne, and saintfoin. The potherbs, radishes, spinach, &c., had their place, whilst the rye-grass, which more particularly demanded observation, occupied a space of five acres.

"Our experiments, however incomplete, have furnished us with data on the new question as to the effect of irrigation with sewer manure.

"Undiluted manure may be distributed on a naked soil. It is necessary to do so a short time before the seed is sown, and the land should be lightly stirred immediately after the irrigation. From the sowing of the seed, and during the whole progress of vegetation, great care has to be taken in the manuring. The plants with soft tissues, or slender stalks, such as the vetches, lentils, haricots, flax, hemp and poppy, suffer generally from the contact of manure, given during their growth, and they suffer in proportion to the strength of the liquid and the dryness and heat of the weather. To cultivate these plants with success it would be better to manure the soil abundantly before sowing, and to abstain from irrigating with manure during the growth of the plant. With regard to fodder-plants, which sprout again after being cut, such as clover, luzerne, &c., it is better to irrigate them only after each cutting; also, whatever the plant may be when it has attained half its growth the irrigating with manure ought to cease, and, in case of drought, pure water may be used, or water charged with at most a twentieth part of manure.

"The root crops, especially beet root, turnips, and rutabagas seem to be the only exceptions to this rule, and are improved by manure during the whole course of their development, that is, if care is taken to mix it with a due proportion of water, according to the degree of heat and the dryness of the air. It is necessary to hoe the ground some time after each dressing, that is, if the plant does not cover the ground.

"Table 4 presents, together with the names of the plants, the principal numerical data relative to our experiments—data to which we must add the following observations:—

"It might seem at first that the cereals were not suited to the manure of towns, as the crops at the dépôt, with the exception of the rye, were certainly less in the irrigated than in the unirrigated land, and yet the same manure had most excellent effects on the cereals of the several farms at Bondy.

"A little consideration, however, will make it clear that these two facts are not contradictory. The produce of the undressed plots proves that the soil was already rich enough for grain crops. The manure in increasing this richness, exceeded the maximum of fertility required by all the plants. The proof of this is that they were laid (*ont versé*). Perhaps, also, the prolonged rains at the beginning of the summer have contributed to this failure and in a drier season the result might have been d ferent. Nothing, therefore, can be concluded from these facts, and the question remains in suspense, except in respect to the Indian corn or maize, whose rigid stalk is not easily laid, and the produce of which will always be, in all probability, in proportion to the amount of manure.

"As to the plants known in commerce as farinaceous, such as beans, haricots, peas, lentils, vetches, &c., they all yielded less in the dressed than the undressed soil. It may, therefore, be concluded that they are unfitted, if not for the manure, at least for the application of it during their vegetation. On the other hand, the potherbs radishes, tomatoes, artichokes, spinach, have flourished perfectly under the treatment, and the rapid growth has not been accompanied by any taste betraying the nature of the nourishment they have received.

"The plants of commerce show considerable difference, whilst the poppy and flax have yielded less with the dressing than without; the Piedmontese and Chinese hemp, chicory for coffee, and the spring colza have yielded more, the last, indeed, in the proportion of 35 to 50. From this we are led to believe, that for the autumn colza a dressing applied before sowing, and then again in winter, and one in the spring, would produce excellent results.

"These variations, not to say anomalies, reappear in the group of root and tuberous plants. Thus potatoes and Jerusalem artichokes have produced less on the irrigated land than on the unirrigated land, and the difference on the rutabaga, although in favour of the manure, is so slight, that it would not be taken as a proof.

"We had foreseen this result in regard to potatoes and Jerusalem artichokes, which cannot bear a too high degree of fertility in the soil without the stalks increasing at the expense of the tubers. It will be, therefore, only on poor soils that sewer manure dressings can be employed for these two crops.

"In complete contrast with these results is that given by the beetroot. This plant, which is the most important of all our crops, and whose cultivation is extending more and more, seems perfectly adapted to the sewer manure, and it is the plants which contain the largest amount of azote that have most profited by the dressings. Thus in the yellow of Vertus the production is increased from 23 to 56, and for the yellow globe beetroot from 28 to 64, whilst for the disette the increase has only been from 33 to 54, and from 42 to 52 for the white sugar beetroot.

"But the grass crops show the most beautiful results. Except the sainfoin, which has failed from some cause which we do not yet know, all the other mowed crops comprising the trefoil and luzerne species, have yielded really magnificent crops: thus the white trefoil, which has generally been merely pastured on the land, has yielded in two cuttings 30,310 kilogrammes, or 29 tons 16 cwt. 2 qrs. 19 lbs. of green fodder. The luzerne, which in the year of sowing does not spring up sufficiently to be cut at all, has been mown three times, and has yielded 31,500 kilogrammes, or about 31 tons, of green fodder on the dressed land, whilst the undressed produced only 14,650 kilogrammes—about 14½ tons.

"The grasses, and especially the Italian rye grass, have exceeded even these; the last gave 27,640 kilogrammes, or 27¼ tons, of green fodder in three cuttings on the undressed land, and 86,260 kilogrammes, or nearly 85 tons, in five cuttings on the dressed land. Reducing this to dry hay, viz., one-third, we have the enormous product of 28,800 kilogrammes, or about 28½ tons, as the ordinary produce of from five to seven hectares of good natural grass land.

"This result alone will suffice to show the advantage that can be derived from the use of sewer manure applied to the production of fodder. France is deficient in fodder, and consequently in cattle, manure, and corn. To procure abundance of fodder would be to procure all the rest.

"But the increase of crops would be hardly an advantage, if in the end the quality of the produce were inferior. Strong prejudices exist on this point. The cattle-feeders assert that the grass will be contaminated with the manure; that the cows will reject it, or if they eat the grass their milk will be affected by it. In order to carry on our experiments without interference, and not to have to contend with the prejudices of these people, we bought at the market of La Chapelle a cow which was not in any respect remarkable. It was a young one, of the Flanders breed, and newly in milk. Put at once to feed on the grass to which manure had been applied, she did not hesitate an instant to eat it. When, some time afterwards, we gave her for the space of twelve days grass that had not been irrigated, she did not seem to distinguish any difference. For four months she fed on the grass from the fortifications and the garden. Her health was perfectly good, and her milk, cream, and butter, which were tasted by more than a hundred persons, were declared excellent. The milk at three different times has been sent to the laboratory at the school of the Ponts et Chaussées, and the analysis has proved that its composition was perfectly normal. Moreover, during ten days of trial of the milk at the hospitals Salpetrière and Riboissière for the invalids, the physicians found it of a superior quality and richness."

The commissioners state as conclusions:—

"Our different experiments have had but one and the same object, viz., to introduce in the neighbourhood of Paris amongst the farmers the use of the valuable town manure, which is as rich as farm manure, and yet has been hitherto neglected owing to the prejudices against it.

"With the view to this, we have engaged a certain number of farmers to try, according to the Flemish method, (that is, of the distribution of sewer manure by the water carts) some experiments, which we made as easy and inexpensive as possible. We have changed the meagre grass of the fortifications into rich herbage. We have applied this manure to almost all the plants of commerce, and to market-garden culture. We have applied it on the new English method, which is admirably adapted to the distribution of town manure, not only because it is specially suited for *liquid* manure, but also, and above all, because it deprives the distribution of all that is repulsive and embarrassing. Moreover, we have demonstrated, even to the most incredulous, that the fodder obtained from this manure did not partake of the flavour or smell of the dressing, and that the milk, &c., was of excellent quality.

"Has the expenditure so liberally granted by the City given any adequate return?

"In an economical point of view our experiments have been of little value. It is not in making additions to the material for culture, in trying new methods of application, in making such experiments, that one can realise the advantages or establish the price of the returns. Moreover, the comparative results at the dépôt have been singularly disturbed by two circumstances, viz., the smallness of the squares of ground allotted to the experiment, and the ammoniacal atmosphere, in the midst of which the plants lived. A space of four metres square was not sufficiently large to prevent a portion of the dressing from going upon the square that was not intended to be subjected to the manure. At the same time, those plants whose respiration is much developed, might derive good from the vapours brought by the wind from the adjacent receptacles which might render the dressing almost useless. A true comparison, however, such as will give exact differential returns, and also the positive price of the returns, the example in fact, which alone will attract numerous followers, can only be found in the real business-like carrying on of a farm. This opinion is not ours only, it is the opinion of those practical men who have taken a deep interest in our experiments.

"Nevertheless, essential facts and useful suggestions have been derived from these trial works. We have shown that the new manure would be used immediately if it could be conveyed conveniently by conduits, boats, or waggons to where it was required, and if the mode of using it were explained. We have settled also several essential points on the subject as to the time, the amount of manure, and the proportion of water required in the irrigation. We have solved also a not less important question, to what crop the sewer manure is most applicable. We have for the first time laid down in France a specimen of the new method of liquid manuring by subterranean pipes. We have demonstrated, thanks to this method, and to the manure of sewers, that 300 hectares of the meagre grass of the fortifications can be transformed into a rich herbage, capable of nourishing 1,000 milk cows. We have proved that the process of vegetation changes this manure so completely, that no odour, or flavour from it, is imparted to the plants. If our experiments have yet left it doubtful if this manure is adapted to the cereals, to the farinaceous plants, and to some of the commercial plants, we have put beyond doubt its efficacy when applied to green crops. This has been remarkably the case with the Italian rye-grass, the crops of which have exceeded any other grown even in the most favourable circumstances, 28,000 kilogrammes, or about 28 tons of dry hay per hectare.

"New fodder is what France is most deficient in. Climate, and the system of culture are equally against the extension of its production. To create around each of our large towns, by the well-understood use of the sewer manure, a belt of fodder, supplying the town and the adjoining neighbourhoods, and becoming itself an abundant source of animal produce, is a certain means of quickly increasing the general production of the country, and placing it on a level with the demands of consumption."

It may appear to be unfair to accept only the most favourable results, and to reject those which are least so; but, in respect to the cereals, the favourable results obtained by the farmers near Paris are confirmed by the three years' increasing crops obtained at Rugby, by the application of sewage alone: last year it was stated to me by Mr. Walker, to have been at the rate of 50 bushels per acre. In France, according to Count Gasparin, extraordinary yields of wheat have been obtained by the method of irrigation. At Mr. Mechi's, and the new liquefied manure farms in England, the yield has been almost invariably one quarter heavier than the highest obtained by the ordinary culture. In respect to the increased production obtained upon these trial works at Paris, which are very satisfactory as far as they go, it is to be observed that it is an increase upon a production much below that which is deemed a very ordinary production in England. In the new cultivation here, for example, 60 to 80 tons of grass per acre, or 160 to 200 tons the hectare has been obtained; and Mr. Dickenson estimates his yield of Italian rye-grass at from 80 to 100 tons the acre, that is to say, 200 to 250 tons the hectare; whereas, as we have seen, about 85 tons the hectare is by them deemed a maximum yield. I venture respectfully to submit that, with their climate, they may manure much higher, and they will obtain a far superior return. The experience of the farmers near Paris, and of farmers in England, as to the applicability of liquefied town manures to the cereals and some of the crops referred to, is indeed confirmed by other experience in France itself. Thus Monsieur Paulet, a writer who has paid great attention to the subject, states:—

"In Dauphiné they spread the town manure upon the wheat and rye in winter, when the ground is still a little hardened by the frost. In spring they apply it principally to barley, a short time before sowing the seed, and they prefer a rainy day to spread it; it is the same for flax and potatoes." He adds, "If anyone has doubts of the astonishing effects produced by the use of town manure, it will be sufficient to dissipate them to traverse the commune of Bron, as also a part of the canton of Magieux (Isère). The soil of this district is a thick stratum of red gravel, and in its natural state is, at the most, suited to the growth of rye and sainfoin. Formerly a large portion of the land was always in fallow; the crops exposed to all the vicissitudes of the seasons in this ungrateful soil scarcely returned the outlay expended upon them. Now, by the use of the town manure, the land has completely changed its character, each year it bears heavy crops of corn, flax, barley, and potatoes. Instead of the miserable sainfoin which they used to cut 50 years ago, they now, everywhere in these districts, mow two crops of trefoil, and, when the season has not been unfavourable, an after-math; in short, the cultivation of the country has undergone a complete revolution. Since the use of the town manure, the rotation of crops is improved, fallows have disappeared; the soil well worked and abundantly manured, suffices, without difficulty, for the various produce which they get from it; wealth has replaced poverty. It is an example fitted to excite the zeal of agriculturists in all countries where they neglect the use of manures. The *direct* method of using manure from dwelling-houses is also excellent; it is far preferable to that method which begins by converting these matters into poudrette, a method which ought to be utterly condemned. Let us hope that the more enlightened agriculturists will employ these town manures, as being even more rich in nutritive elements and abounding in salts." I will only add that the conclusions of the commissioners in favour of the direct application of manures are given on the consideration of the experience in a theatre of chemical works, patented processes, solidifications, and disinfectants, having all undoubtedly failed there; and I could not find that the chief manufacture—that of poudrette, a solidified manure, after the evaporation and loss of two-thirds of the fertilising matter,—was spoken of otherwise than as by M. Paulet. Nor, although many of these processes have been re-invented or re-patented in England, have I heard of one authenticated instance of their success; and I have been recently informed that none are known at the Royal Agricultural Society. These first trial works at Paris are deemed there to be highly important as indications, and I am informed that other works on a large practical scale, such as the commissioners recommend, are resolved upon; and it is understood that some in the Landes adverted to in the speech of the Emperor to the Legislative Assembly, are intended to be cultivated on the new principle with liquefied manure.

The sanitary results, though the application was of decomposing manure, and in a poor and one of the least absorbent soils, appear to have been satisfactory. On this point I will endeavour to repeat some further elucidations, because it is industriously assumed as an undoubted fact that all such applications must be unavoidably and necessarily offensive; and so they would be if, as is commonly assumed, all applications of sewage were made after the method of submersion in use near Edinburgh, so as to form a water meadow, or sewer marsh, and that too of decomposing manure. This I was one of the foremost to condemn. But those who raise this objection should make themselves better acquainted with the properties of soils, and should be aware that common earths are up to a certain point the most powerful of disinfectants. Let the common kitchen practice be regarded, that when the cook has an "oniony knife," from which the smell cannot be got rid of by any extent of rubbing, immersion in garden mould is found to be effectual; and so with restoration of over-kept game and tainted meat, by surrounding it with fresh soil. During the cholera at Newcastle and other places, when we got the people to put two or three inches of fresh earth over the foul places surrounding their habitations, they felt themselves at once in a purified atmosphere, which was new to them. All those who have been accustomed to pass over our parks when they receive their top-dressings, will have been annoyed by the stinks from them, which last for many days, during which time the most valuable manure is wasted in the pollution of the common air. If, however, that same manure were put in solution in a sufficient quantity of water, and applied by the water-cart or the jet, the nuisance is so far reduced as to be inconsiderable, even for the few minutes application; the manure is received, not in mechanical suspension, as supposed by Baron Liebig, and to be washed out by every shower of rain, but in immediate chemical combination, as proved by the repeated demonstrations of Professor Way, there to be retained through the winter's storms and frosts and snows until taken out by vegetation. But when the tubular house drainage and sewerage is so arranged, as it is in many town districts, drained on the new principle, when the sewage is removed immediately, and before incipient decomposition can have made any progress, that is to say, inoffensively, and when it is at once applied to the land, then entirely new conditions, sanitary as well as agricultural, and in advance even of the satisfactory results recited as obtained in Paris, are achieved.

At Rugby, as I have stated, and now, I am glad to say, at Watford, the town excreta are in the land within two hours of its production, and it is demonstrable from our experience, that the whole of the matter kept wasting under the houses of Paris for a year, might be upon distant lands within half a-day, and all that is now thrown into the Thames in London could be deposited on the soil within a day, that is to say, three days before the ordinary period of the commencement of full decomposition. Augmented in fertilising power as the manure is, by the prevention of waste, and by its direct application to land, the whole of the later experience shows that the absorbent powers of land are far greater than has heretofore been calculated even by well-informed horticulturists. At Rugby, the undecomposed sewage of 1,000 houses is applied in round numbers to nearly 500 acres; but pumping every day, except Sunday, it affords only three or four dressings in the year to the whole of the land, whilst on the liquefied manure farms, eight or ten dressings are applied, and by supplying water to the plants at the same time, horticultural experience shows that the number of dressings will be considerably augmented. Mr. Walker, the owner of the land irrigated at Rugby, assured me that if he were to do the work over again, he would restrict his distributing apparatus to less than half his present area, and various experience indicates, as a generally ascertained conclusion, that the whole of the fresh sewage of five houses, or of twenty-five persons, applied directly, may be utilised on one acre of cultivated land. At this rate the pollution of the air of houses, which, I beg to say, is of more importance than the water of the Thames, however important that may be, and the pollution of that river may be avoided—the sewage may be utilised on a space of ten miles square, or on a belt of land a mile and a quarter broad whose inner circle begins at a distance of five miles from St. Paul's. For Paris, of course, less than half the space would be required. Then why, it may be asked, is it that those demonstrations are not acted upon? These questions I can only proximately answer by other questions, as why is it in respect to agriculture, that little more than one twentieth of the land that requires draining is drained, although nearly a quarter of a century ago demonstrations were given of the efficiency of land drainage, and although it was early proved that it repaid its expenses in eight, six, and even four years? Why will most farmers continue to let all their liquid manure run into ditches, and (as shown by Professor Voelcker,) allow two-thirds of the fertilising power of the solid manures to be wasted by exposure to the weather? Why is it that in the interior of towns rough and large, and expensive constructions which accumulate foul matters, are maintained in the face of the working of small and smooth, and comparatively cheap constructions which discharge them? I am answered, that in our present state it requires many years to ensure prevalence to very simple principles. For my own part, I am compelled to confine my hopes to seeing eventually, the more general practical adoption of two of the simple principles, which I may pretend to have elaborated; one of which is for towns, that all smells of decomposing animal and vegetable matter, mean eventually, and when intense, immediately, disease, and show defective administration; the other of which, is for rural districts and for agriculture, that all smells of decomposing animal and vegetable matter, mean the waste of valuable manure, and bad husbandry; in short, making it understood and practically acted upon,—that whether in urban or in rural districts, the unlearned population may test the administration by that ill-used organ which God has given us all for warning—the nose.

SOCIETY OF ARTS EXAMINATIONS.

The following paragraph is taken from the *Leeds Mercury*:—

The interest taken by the working classes in the competition is very great. As evidence of this, a candidate from one of the Lancashire towns was attended to the train, on his departure for Huddersfield, by a number of his fellow-workmen and friends, who by many a hearty phrase and kindly gesture cheered him on in the great struggle on which he had entered. On the nights of the previous examinations the lobbies of the Huddersfield Institution were crowded by the candidates eager to learn the issue, and those from a distance who had passed the first ordeal were soon busy writing brief but fervid despatches to their friends.

THE NAUTILUS DIVING MACHINE.

Some experiments with this machine (of which a full description, with diagrams, will be found at page 243 of the present volume of the *Journal*) took place on Tuesday, the 9th inst., at the Victoria Docks. A large number of engineers and scientific men were present, among whom were Mr. Robert Stephenson, M.P., F.R.S., Mr. G. Parker Bidder, Sir S. Morton Peto, Bart., Mr. Joseph Locke, M.P., F.R.S., Mr. Edwin Clark, Mr. Charles Manby, F.R.S., Mr. Charles Vignoles, F.R.S., Mr. J. Scott Russell, F.R.S., Mr. J. P. Gassiott, F.R.S., Professor Robert Hunt, F.R.S., Mr. W. Bridges Adams, and Mr. Appold. Many of the gentlemen present descended in the machine, and examined the details of its construction, as well as the arrangements for the supply of air. It was clearly demonstrated, not only that several persons could remain in it under water for a considerable time, but that even if the tube communicating with the reservoir at the surface should accidentally become disconnected, no danger would ensue to those in the machine, as they were able, by means of the compressed air within the bell itself, to expel a portion of the water, and thus to rise to the surface. The Nautilus has been for some time in use at the Victoria Docks, in relaying the sills of the dock-gate. At the close of the experiments a *déjeuner* was provided for the company present, Mr. G. P. Bidder occupying the chair.

Mr. Robert Stephenson, in proposing "Success to the Nautilus Company," said this was a machine of which almost every civil engineer had felt the want; and whilst the use of the old diving bell was confined to certain conditions not always to be obtained, this was universally applicable and ready for use in the most difficult cases. The engine and condensing pump, which he had inspected, were scarcely inferior in ingenuity and completeness to the diving apparatus itself. He expressed his conviction, from a personal examination of the capabilities of the machine, that he had never witnessed one so perfectly adapted to the purposes for which it had been designed. He had it from the resident engineer of the docks that the same amount of work that had, previously to the introduction of the Nautilus, been performed in three weeks and four days, had been got through by its means in two days and two hours, with the same number of men employed.*

Mr. Hallett and Major Sears returned thanks.

Mr. Joseph Locke, Mr. Vignoles, Sir S. Morton Peto, and Mr. Scott Russell, in turn addressed the company, and bore testimony to the excellence of the apparatus.

MEETINGS FOR THE ENSUING WEEK.

Mon. Architects, 8.
Chemical, 8.
United Service Inst., 8½. I. Mr. Robert Mallett, F.R.S., "On the Form, Construction, and Wear of Artillery in relation to the Molecular Construction of the Metals employed in its construction." II. Mr. Reeder, "On his Patent Mariners' Time Compass."

Tues. Linnæan, 8. I. Mr. F. Smith, "On the Aculeate *Hymenoptera* of Borneo." II. Mr. Oliver, "On *Rotifera* found in the genus *Vaucheria*." III. Sir R. H. Schomburgk, "On a monstrous state of the Banana."
Statistical, 8. Mr. William Newmarch, "On the Electoral Statistics of the Counties and Boroughs of England and Wales during the twenty-five years from the Reform Act to the present time."

Wed. Geological, 8. Prof. Phillips, "On some Comparative Sections of the Oolites of the North of England."

Thurs. Royal Society Club, 6.
Antiquaries, 8.
Philological, 8.
Chemical, 8. I. Dr. Hofmann, F.R.S., "On Thialdine." II. Mr. Field, "On the separation of Chlorine, Bromine, and Iodine." III. Drs. Roscoe and Pettinkofer, "On the state of the air in unventilated apartments." IV. Mr. Hobson, "On a new series of Organothronic Acids." V. Dr. Gladstone, F.R.S., "On an optical test for Didymum."
Royal, 8½.

Fri. United Service Inst., 3. Dr. James Bird, "On the means of practically applying the Principles of Medical Geography to the preservation of the health of Soldiers and Seamen in Foreign Climates."

Sat. Asiatic, 2.

PARLIAMENTARY REPORTS.

SESSIONAL PRINTED PAPERS.

Par. No.

Delivered on May 26th, 27th, and 28th.

22. Bills—Oaths.
28. ——— Fraudulent Trustees, &c.
30. ——— Registration of Voters (Scotland).
23. ——— Sheep, &c. Contagious Diseases Prevention.
25. ——— Industrial Schools (amended).
31. ——— Registration of Voters.
32. ——— Princess Royal's Annuity.

PATENT LAW AMENDMENT ACT.

APPLICATIONS FOR PATENTS AND PROTECTION ALLOWED.

[*From Gazette, June* 5.]

Dated 4th April, 1857.

950. John Henry Johnson, 47, Lincoln's-inn-fields—Improvements in steam-hammers. (A communication.)

Dated 6th April, 1857.

958. Bartholomew Predavalle, 106, Great Russell-street, Bedford-square—A new motive power.

Dated 7th April, 1857.

980. Henry Brierly, Chorley, Lancashire—Improved mules or machinery to be used in spinning.

Dated 13th April, 1857.

1046. Patrick Mc Farlane, Glasgow Bank, Comrie, Perth, N.B.—Improvements in looms for weaving.

Dated 18th April, 1857.

1098. William Henry Dearing Granville, 44, Holborn-hill—Improvements in fire-arms, and in the means of loading the same.

Dated 53rd April, 1857.

1142. Solomon Philipp Hecht, Gresham-street—Improvements in the manufacture of moulds for making fancy tobacco pipes and other ornamental articles from plastic materials. (A communication.)

Dated 6th May, 1857.

1285. Frederick Martin Schwab, Carlisle-street—Improvements in breech-loading fire-arms.

Dated 9th May, 1857.

1307. William Glover, Manchester—Improvements in machinery for weaving.
1309. William Hebdon, Pavilion, Weedon, Northamptonshire—Testing the strength of woollen cloth, linen, and all other woven fabrics, also of every description of material upon which a strain can be exerted.
1311. William Player Miles, 4, Dartmouth-villas, Perry-vale, Sydenham—An improved gauge-cutting machine.
1313. Francis Watkins, Victoria Works, Smethwick, near Birmingham—Improvements in machinery for making rivets, bolts, and spikes. (A communication.)
1315. John Pym, Pimlico—Improvements in machinery to be employed on the water for raising and lowering weights.

Dated 12th May, 1857.

1331. Edwin Cotterill, Birmingham—A new or improved method of preventing the picking of ordinary locks, and other fastenings.
1333. Rose Celestine Carbonino (Widow de Favre), Paris—Improvements in nose bags.
1335. James Drysdale Malcolm, 47, Leicester-square—Improvements in the construction of buffing apparatus for railway engines and carriages.
1337. Thomas Lambert, Short-street, New-cut, and Obed Wakefield, 23, Lambeth-terrace, Lambeth—Improvements in apparatus for drawing off water and other fluids.
1339. Richard Archibald Brooman, 166, Fleet-street—Improvements in the preparation of steel, and in the steeling or manufacture of tyres, shafts, axles, and other forgings. (A communication.)
1341. William Edward Newton, 66, Chancery-lane—Improvements in furnaces specially adapted to the generation of steam for motive power, but applicable to furnaces for other purposes. (A communication.)
1343. William Massey, Newport, Salop—Improvements in engines for the cultivation of land by steam power.

Dated 13th May, 1857.

1345. Stephen Yeldham, 9, Stamford-street—The better application and arrangement of indices to books of all kinds.
1347. Edward Eley, City-road Steam and Hot Water Works, Union-place, City-road—Improvements in the manufacture and application of pipes for heating purposes.
1349. Abraham Fitzgibbon, Canada—Improvements in the form of rails for use in railways and tramways.
1351. Richard Dugdale Kay, Accrington—Improvements in machinery or apparatus for printing woven or felted fabrics. (A communication.)
1353. John Peak, Wigan—Improvements in the manufacture of gas.
1355. Joseph Fielding, Ashton-under-Lyne—An improvement in apparatus applicable to steam pipes or cylinders used for heating and drying, which said apparatus may be similarly employed wherever steam is used for such purposes.

Dated 14th May, 1857.

1359. William Sissons and Peter White, Kingston-upon-Hull—Improvements in steam pile driving machinery.
1361. William Hyde and Joshua Hyde, Dudley, Worcester—Improvements in the construction of vices.
1363. George Crawford, Edinburgh—Improvements in pianofortes.
1365. Edmund Hollingworth, Weston Underwood, Derbyshire—Improved machinery or apparatus for washing linen and other articles.
1367. Daniel Reading, Claverdon, Warwick—A new or improved spring for carriages or other vehicles.
1369. Charles Bartholomew, Rotherham, and John Heptinstall, Masbro', Yorkshire—Improvements in machinery for rolling tyres and hoops for railway and other wheels, and also other articles made of iron and steel.

Dated 15th May, 1857.

1371. Michael Joseph Vanderborght, 46, Rue Neuve, Brussels—A new system of machinery producing simultaneously the threefold effect of casting, breaking off, and rubbing (smoothing) of printing characters.

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* The following is the report of the resident engineer:—

"Victoria Docks, June 8th, 1857.

"The work performed by the "Nautilus," under my superintendence, in replacing the roller-path of the outer gates at this dock, has been, for the week ending the 6th inst., 43 hours, or 4 days and 3 hours. In this time two sections have been cut around (concrete), the connecting bolts cut off, the old paths taken up, and two new ones replaced. One entire tide was lost, of eight hours, in replacing some wedges which were disturbed by the opening of the dock gates. The last section was placed in twenty minutes after being lowered down. During the time the dock has been undergoing this operation, the gates have been regularly opened every tide, no delay whatever having been experienced. I have yet five other sections to put down. Last summer, in putting down a new, and removing one old section, by the aid of my men in submarine armour, I was occupied three weeks and four days, during all of which time the gates were of necessity open, and the locking was done from the tidal basin. The efficiency of the Nautilus in this operation, is demonstrated by its performing the work of three weeks and four days, in two days one and a-half hours, there being no more men employed in the one case than in the other. I have been down in the "Nautilus" very often, and I am satisfied that very nearly the same amount of work can be done under as above water in laying masonry, &c."

1373. Frederic Whitaker, Islington—Improvements in the construction of machinery for sewing and embroidering.
1375. Isaac Whitesmith and William Whitesmith, Glasgow—Improvements in weaving.
1377. David Carter, Honley, near Huddersfield—Improvements in machinery or apparatus for cleaning the waste of woollen or other fibrous manufactures, or for recovering the wool or other fibres from such waste substances or materials.
1379. Sophia Sands, Nottingham—Improvements in the manufacture of fringes. (A communication.)
1381. Richard Archibald Brooman, 166, Fleet-street—An improvement in the construction of oil cans. (A communication.)
1383. Francis Parker, Elm-house, Homerton—An improved tell-tale for public vehicles.

Dated 16*th May*, 1857.

1385. Charles William Ramié, Camberwell—A mode of attaching handles to table cutlery.
1387. Henry Trappes, Manchester—An improvement in the construction of a sliding drawer, applicable to all steam engines, either fixed or locomotive, for the distribution of steam, aeriform, or liquids, used either as a motive power or for any industrial or artistic purpose. (A communication.)
1389. Joseph Ellis, Port Hope, Canada—Improvements in the manufacture of artificial stone.
1391. Nathaniel Ogle, Jersey—An improved method of propelling and ventilating ships.
1393. Richard Bradly and William Craven, Westgate-common Foundry, Wakefield—Improvements in machinery or apparatus for making bricks and tiles.

Dated 18*th May*, 1857.

1395. John Avery, 32, Essex-street, Strand—Improvements in mills for grinding corn and other like substances. (A communication.)
1397. William Edward Newton, 66, Chancery-lane—Improvements in the manufacture of boots, shoes, and other coverings for the feet. (A communication.)
1399. William Clark, 53, Chancery-lane—Improvements in the manufacture of silk, and in the machinery used therein. (A communication.)

Dated 19*th May*, 1857.

1401. John Carnaby, Snow-hill—An improved registering index for gas and other meters.
1405. Julius Friedrich Philipp Ludwig Von Sparre, Eisleben, Prussia—Improvements in separating substances of different specific gravities, and in the machinery and apparatus employed therein.
1407. William Whitehead, Huddersfield—Improvements in cards for Jacquard mechanism.
1411. Louis Cornides, 4, Trafalgar-square—Improvements in the manufacture of gelatine and glue.

Dated 20*th May*, 1857.

1413. John Hardley, Shide, Isle of Wight—An improved apparatus for bruising and grinding vegetable substances.
1417. Henry Keogh, 37, Hugh-street, and Ffrench Augustus Keogh, 9, Inner Temple—Lighting the public gas lamps in the cities and towns of Great Britain and Ireland by electricity, and for turning off and on the gas to same simultaneously.
1421. Elijah Aldis, 31, North-street, Manchester—Improvements in cramps for flooring and other purposes.
1423. James Abbot, jun., Bilston, Richard Handley Thomas, Kidgrove, John Young, Bilston, and James Edward Hunt, Highfields, near Bilston, Staffordshire—Improved machinery for blooming iron.
1425. James Honiball Tozer, Liverpool—Improvements applicable to travelling caps and other coverings for the head.
1427. William Clark, 53, Chancery-lane—Improvements in the preparation of the colouring matter, called murexide. (A communication.)
1429. Edward Curtis Kemp, Avon-place, Pershore-road, Birmingham—Improvements in unions for gas pipes and other pipes or tubes. (A communication.)

Dated 21*st May*, 1857.

1431. Peter Armand le Comte de Fontainemoreau, London, Paris, and Brussels—Certain improvements in the processes for detaching or separating calcareous rocks. (A communication.)
1433. William Blacklidge, jun., Hoghton, and George Read, Bolton le-Moors, Lancashire—Certain improvements in the construction of churns, which said improvements are also applicable to other agitating or stirring apparatus.
1435. William Foster, Black Dike Mills, Bradford—Improvements in the making of worsted and woollen yarn.
1437. William Edward Newton, 66, Chancery-lane—An improved method of sewing or stitching fabrics together. (A communication.)

Dated 22*nd May*, 1857.

1439. John George Taylor, Glasgow—Improvements in writing materials.
1441. Christophe Muratori, 9, Rue Lafitte, Paris—Obtaining a new sort of white by silicate of magnesia and oxide of zinc, or by silicate of magnesia and carbonate of lead, in the first case a composition of zinc, and in the second a composition of lead.
1445. Perceval Moses Parsons, Duke street, Adelphi—Improvements in making moulds for casting railway chairs and other articles in metal, and in apparatus for that purpose.
1447. Frederick Walton and John Pinson, Wolverhampton—New or improved machinery for stamping or raising metals.
1451. Peter Effertz, 57, Nelson-square, Blackfriars-road—Improvements in machinery for making bricks.

Dated 23*rd May*, 1857.

1453. William Carron, Birmingham—A new or improved nail, spike, or bolt, and machinery for manufacturing the same.
1455. Pascal Florentin Coulon, 39, Rue de l'Echiquier, Paris—Certain improvements in velveting paper and textile fabrics.
1457. John Rankin, Manchester—Improvements in ventilators.
1459. Thomas Silver, Philadelphia, U.S.—An improved steam engine governor.
1461. John Phillips, Clipston-street, Portland-road—Improved apparatus for supporting and propelling the human body in water.

Dated 25*th May*, 1857.

1463. Walter James Handscombe Rodd, 3, Earl's-court, Westminster—A method of sailing or propelling a vessel or vessels out of or on the surface of the water.
1465. Schofield Crowther Sheard and George Underwood, Yorkshire Works, Smethwick, near Birmingham—Certain improvements in supplying boilers with water, generating steam, and consuming smoke, and which said improvements are applicable to marine, locomotive, stationary and other boilers.
1469. Nicolaus Charles Szerelmey, 5, Bermuda-place, Bath-road, Peckham—Improvements in preparing combinations of materials for coating wooden and iron ships or vessels.
1471. William Fox, 28, Rue Constantine, Boulogne sur-Mer—Improvements in the manufacture of steel pens.
1473. Henry Cogan, Trent, Somerset—An improved adjustable connection or joint, particularly applicable to agricultural implements.
1475. Marin Joseph Alphonse Mille, Paris—Improvements in producing gas.
1477. Louis Desiré Aubert, Paris—Improvements in fastenings for securing rails in the chairs.
1479. William Edward Newton, 66, Chancery-lane—An improved mode of relieving the slide valves of steam engines from unnecessary pressure. (A communication.)

WEEKLY LIST OF PATENTS SEALED.

June 5*th.*

2885. Robert Davison and Joshua Crowther.
2892. Heth Ogden and Henry Hibbert.
2896. Christian Schiele.
2902. John Leslie.
2910. Robert Frederick Miller.
2911. Edward Burwell.
2927. Alexander Macarthur.
3052. William Macpherson.
3078. Thomas Shaw.
102. GeorgeEskholmeandHenry Wilkes.
103. Richard Chrimes.
207. GeorgeEskholmeandHenry Wilkes.
240. GeorgeTomlinsonBousfield.
758. Thomas Yarrow.
945. Richard Birkin, junr., and Thomas Isaac Birkin.

June 9*th.*

2920. Joseph Walton.
2926. William Storey and Thomas Storey.
2931. Jacob Green.
2932. Joseph Chatwin.
2940. William Lund.
2945. Charles Humfrey.
2946. Henry King.
2993. Godwin Meade Pratt Swift Viscount Carlingford.
3011. John Murdoch.
3023. William James Payne.
3037. Joseph Sharp Bailey.
3081. William Swain.
3093. William Edward Newton.
77. John Henry Johnson.
137. George Tomlinson Bousfield.
291. William Edward Newton.
365. Perceval Moses Parsons.
459. John Goodman.
541. Alexander Parkes.
771. Samuel Campbell.
789. William Johnson.
883. Antoine Joseph Quinche.
983. Jean François Victor Larnaudès.
991. Alfred Vincent Newton.
1061. Henry Willis.

PATENTS ON WHICH THE STAMP DUTY OF £50 HAS BEEN PAID.

June 2*nd.*

1443. John Kolbe Milne.

June 4*th.*

1270. Thomas Richardson.
1279. Julian Bernard.

June 6*th.*

1262. John Wilson.
1288. John Young.

WEEKLY LIST OF DESIGNS FOR ARTICLES OF UTILITY REGISTERED.

No. in the Register.	Date of Registration.	Title.	Proprietors' Name.	Address.
3995	June 10.	Lifting and Traversing Jack	James Thornton and Sons	Birmingham.

Journal of the Society of Arts.

FRIDAY, JUNE 19, 1857.

THE ANNUAL GENERAL MEETING.

The Annual General Meeting, for receiving the Council's Report, and for the Election of Officers for the ensuing year, will be held on Wednesday, the 24th inst., at 4 p.m. Bye-law, sec. 102, provides that "the balloting list shall be published with the *Journal* of the Society, on the Friday previous to the day of election, and a copy sent to every member of the Society." The balloting list, duly prepared, is issued with this number of the *Journal*. Bye-law, sec. 42, provides that "at this meeting the Council shall render to the Society a full account of all their proceedings and a statement of the funds of the Society, and of the receipts, payments, and expenditure, during the past year, and a copy of such statement shall be published in the *Journal* of the Society on the Friday before such General Meeting." The statement in question is now annexed.

ANNUAL STATEMENT OF RECEIPTS, PAYMENTS, AND EXPENDITURE, FOR THE YEAR ENDING 30TH MAY, 1857.

Dr.

To Subscriptions for the year ending the 30th May, 1857:—	£ s. d.	£ s. d.	£ s. d.
From Members and Institutions in Union with the Society	3556 18 9		
Outstanding	1140 6 0		
		4697 4 9	
Deduct due on former years	371 14 0		
Estimated not recoverable	153 14 4		
		525 8 4	
		4171 16 5	
To Life Contributions		299 18 0	
			4471 14 5
To Dividends on Stock:—			
£3166 13s. 4d. Consols		88 13 6	
1969 10s. 6d. ditto, held in special trust		55 2 10	
388 1s. 4d. New 3 per Cent. Annuities		16 6 0	
			160 2 4
To Special Objects:—			
Royal Commissioners of the Exhibition of 1851, in repayment of expenditure on account of the Trade Museum		576 16 0	
Examination Frize Fund, 1856:—			
Received	21 0 0		
Outstanding	10 10 0		
		31 10 0	
Do. do., 1857, held in trust:—			
Received	152 15 0		
Interest	2 0 5		
Outstanding	240 0 0		
Prize Essay on the Financial Position of the Country	210 0 0		
Prize Essays on Marine Algæ	70 0 0		
Prize Essay on the Smoke Nuisance		25 0 0	
T. Twining, jun., in aid of the Working Classes Museum		100 0 0	
Medical Society of Graham's Town, for purchase of Instruments		20 0 0	
Sale of Transactions		3 2 6	
Catalogue of Exhibition of Inventions		6 9 6	
Repairs to Photographic Collection		2 13 4	
Microscopes, by cash	90 0 0		
Do. in hand	103 6 6		
		193 6 6	958 17 10
			£5590 14 7

Cr.

By General Establishment Expenses:—	£ s. d.	£ s. d.
Rent, Rates, and Taxes	192 19 0	
House and Office	147 15 6	
Salaries, Wages, and Commissions	925 16 4	
Postage Stamps and Parcels	134 9 9½	
Stationery and Printing	196 0 1	
Advertisements	10 6 3	
		1607 6 11½
By Special Objects:—		
Medals and Rewards	62 18 6	
Examination Prizes	89 5 0	
Swiney Prize	1 4 0	
Marine Algæ Prizes	0 12 6	
Working Classes Museum	159 3 6	
Trade Museum	0 3 0	
Prince Albert's Speeches	20 0 0	
Conversazioni	148 10 3	
		481 16 9
By Journal	854 14 6	
Less charged to Union of Institutions	170 18 10	
		683 15 8
By Exhibitions:—		
Patented Inventions, 1856-7	86 2 6	
Belgian Exhibition, 1856	5 7 6	
		91 10 0
By Committees:—		
Union of Institutions, including Journal Lecture List, Examinations, Dr. Booth's Lectures, Postage, Stationery, Printing, and other charges	819 15 4½	
Paris Improvements	11 0 0	
		830 15 4½
By Repairs and Alterations	426 13 1	
One Year's Interest on Debenture	36 5 6	
Part Repayment of Principal secured by Debenture	750 0 0	
Repayment to G. T. Kemp of Loan, not bearing Interest	50 0 0	
Library and Pictures	14 10 0	
Microscopes	239 15 6	
Dinner, 1856	33 9 0	
Medical Society, Graham's Town	20 0 0	
		1570 13 7
		5265 18 4
By Excess of Income over Expenditure		324 16 3
		£5590 14 7

BALANCE SHEET, 30TH MAY, 1857.

Dr.

To sundry Creditors, viz.:—		
To Tradesmen's Bills	£986 3 1	
Salaries and Commissions	19 5 4	
Medical Society, Graham's Town	20 0 0	
Debenture at 4½ per cent.	250 0 0	
		1275 8 5
To Trust Liability in respect of Government Stock (Consols) held for specific purposes, as per contra, viz.:—		
Set apart to answer—		
Swiney Prize	1333 6 8	
Acton Trust	536 3 10	
Stock Trust	100 0 0	
Fothergill Trust	388 1 4	
By Excess of Assets over Liabilities		3140 4 5
		£4415 12 10

Cr.

By Cash in Hand:—		
At Messrs. Coutts and Co.	£185 3 2	
At Commercial Bank	278 18 0	
		464 1 2
At London and Westminster Bank, applicable to specific purposes	364 15 5	
By Consols, £3166 13s. 4d., at 93		2945 0 0
By Subscriptions in arrear	1140 6 0	
Estimated as not recoverable, to the amount of	153 14 4	
		986 11 8
By Subscriptions to Examination Prize Fund outstanding	240 0 0	
,, Marine Algæ Prizes Do.	70 0 0	
,, Prince Albert's Speeches		20 0 0
By Government Stock held in trust, applicable to specific purposes, viz.:—		
Consols	1969 10 6	
New 3 per Cents.	388 1 4	
		£4415 12 10

(Signed) W. B. SIMPSON, WM. T. MACKRELL, } Auditors.
P. LE NEVE FOSTER, Secretary.

June 16, 1857.

DISTRIBUTION OF PRIZES.

The prizes awarded by the Society's Examiners to the successful Candidates at the June Examination in London will be distributed on the morning of Tuesday, the 23rd instant, at the Society's House in the Adelphi, at 11 o'clock, the Right Honourable Sir John Pakington, Bart., M.P., in the chair.

ANNUAL DINNER.

The Society's Annual Dinner, Lord Stanley, M.P., in the chair, will take place at the Crystal Palace, on Tuesday, the 23rd inst., at SIX o'clock, instead of five as originally announced.

This alteration has been made in order to suit the convenience of those attending the Queen's Drawing-room.

SIXTH ANNUAL CONFERENCE.

The Sixth Annual Conference of the Representatives from Institutions in Union with the Society, is appointed to be held at the Society's House on Wednesday the 24th instant, at 10 o'clock. Colonel Sykes, M.P., F.R.S., Chairman of Council, will preside.

PETITION TO PARLIAMENT.

The following petition from the Society to the House of Commons was presented by Colonel Sykes, M.P., F.R.S., and Chairman of the Council. Colonel Sykes has given notice that he will, on an early day, call the attention of the House to its contents.

To the Honourable the Commons of Great Britain and Ireland, in Parliament assembled.

The Humble Petition of the Society for the Encouragement of Arts, Manufactures, and Commerce.

Sheweth,

That for many years past the attention of your honourable House has been directed to the subject of National Education, with a view to promote its improvement and extension; that large sums have been voted by your honourable House for that purpose from time to time, especially during the last few years; that the results of this continued care and expenditure are inadequate and unsatisfactory; that the average age at which the children of the industrial classes are found to leave school, has from year to year been gradually diminishing, and that direct interference or legislative interposition with the parents of such children, or with adults themselves, would neither be in harmony with our national character nor popular institutions.

Impressed with the reality of these evils, and the hopelessness of legislative redress, the Society of Arts, for some years past, has been engaged in the organization of a system of periodical general examinations, to be held simultaneously throughout the country, with a view to promote self-instruction and voluntary application, to hold out inducements to study by means of certificates and prizes, and to stimulate exertion by the hope of social advancement and permanent employment.

The Society of Arts has associated with it 358 of the Mechanics' Institutions of the United Kingdom, and with all it carries on a mutually beneficial correspondence. In these associated Institutions, it has laboured to establish class teaching and systematic instruction; and although the Society's scheme of examinations is practically before the public for little more than twelve months, a marked improvement has already taken place in the character of the class instruction, and in the attendance on the classes at many of the Institutions in Union; while in others, for the first time, class-teaching has been established expressly with reference to the Society of Arts examinations. Stimulated by the hope of obtaining distinction at these examinations, young men are found to attend the classes with remarkable diligence and zeal. This system of periodical examination was successfully inaugurated last June, at the Society's House in the Adelphi, with 52 persons, when prizes and certificates were awarded to candidates, some of whom have since obtained official appointments. The examinations, conducted on a more extensive scale this year in London and at Huddersfield, have recently terminated, at which nearly 300 persons were examined. For this year a special prize fund, upwards of £500, has been subscribed by the promoters of the scheme, and this independently of local contributions. Considerably more than 500 of the most eminent manufacturing and commercial firms, and great employers of labour throughout the country, have signed a formal declaration of confidence in the examinations and certificates of the Society of Arts. The examinations are not restricted to physical science; they include as well, mathematics, physical geography, English history, English literature, modern languages, and drawing. The Society of Arts, so far as the funds at its disposal will allow, proposes to develop its scheme of examinations until, taking advantage of railway facilities, the local centres of examination shall be so far multiplied as to bring the advantages of the system easily within the reach of all.

Finally, the Society of Arts begs, with much deference, to place before your honourable House the following facts:—That the Society, incorporated as "The Society for the Encouragement of Arts, Manufactures, and Commerce," has been established for more than a century; that it has, on public objects alone, expended upwards of £150,000 in that time; that it has been the originator of several societies of great and acknowledged usefulness; that the germ of the Great Exhibition was developed within its walls; that, for nearly a century past, it has occupied its own hired house in the Adelphi; that it has never been accommodated with apartments provided by the State; that, during the whole long period of the Society's existence, it has neither asked nor received a single shilling of public money for any purpose whatever; and that it has secured, continues to retain, and will labour to deserve, the confidence frankly and freely reposed in it by the Mechanics' Institutions, as also by the commercial and manufacturing classes of the country. That the sphere of the Society's operations is now rapidly expanding, since applications to hold periodical examinations, and to award certificates, have already been received from York, Birmingham, Huddersfield, Leeds, Nottingham, Salisbury, and other provincial centres. The Society of Arts therefore humbly prays that your Honourable House will take into consideration and give effect to such measures, as to your Honourable House may seem fit more completely to realise the objects of the Society of Arts in the establishment of its periodical examinations, and your petitioners will ever pray, &c.

RATING OF LITERARY AND SCIENTIFIC SOCIETIES AND MECHANICS' INSTITUTIONS.

The following is the bill prepared by the Society's Committee to "Amend the Act 6 and

7 Victoria, chapter 36, to exempt from County, Borough, Parochial, and other Local Rates, Land and Buildings occupied by Scientific and Literary Societies." This bill has been brought into the House by Mr. Hutt, M.P., has been read a second time, and now stands committed for the 24th instant.

Whereas by an Act passed in the sixth and seventh years of the reigh of her present Majesty it was enacted, from and after the first day of October, one thousand eight hundred and forty-three, no person or persons should be assessed or rated or liable to be assessed or rated or liable to pay to any county, borough, parochial, or other local rates or cesses, in respect of any lands, houses, or buildings, or parts of houses or buildings, belonging to any Society instituted for purposes of science, literature, or the fine arts exclusively, either as tenant or as owner, and occupied by it for the transaction of its business and for carrying into effect its purposes, provided, that such Society should be supported wholly or in part by annual voluntary contributions, and should not, and by its laws might not, make any dividend, gift, division, or bonus in money unto or between any of its members; and provided also, that such Society should obtain the certificate of the barrister-at-law or lord advocate, as thereinafter mentioned: And whereas it is expedient to amend the said statute: Be it therefore enacted by the Queen's most excellent Majesty, by and with the advice and consent of the Lords Spiritual and Temporal, and Commons, in this present parliament assembled, and by the authority of the same, as follows:

I. From and after the *first day of September one thousand eight hundred and fifty-seven* so much of the said Act as is herein-before recited, as also the whole of section six of the said Act, shall be repealed.

II. From and after the *first day of September one thousand eight hundred and fifty-seven* no person or persons shall be assessed or rated or liable to pay to any county, Borough, parochial, or other local rates or cesses in respect of any lands, houses, or buildings, or parts of houses or buildings exclusively occupied by any Society instituted for purposes of science, literature, education, or the arts, and supported wholly or in part by annual voluntary contributions, and which shall not, and by its laws may not, make any dividend, gift, donation, or bonus in money unto or between any of its members: provided, that such Society shall obtain the certificate of the barrister-at-law, as provided by the recited Act, or the certificate of the registrar of Friendly Societies in Scotland, as hereinafter provided.

III. If any such Society shall occasionally let, for purposes connected with science, literature, education, or the arts, any part of the land or buildings occupied by it, such letting shall not prejudice or prevent the title of such Society to the exemption aforesaid; but for the purposes of this Act the said land and buildings shall be deemed to be exclusively occupied by such Society for purposes of science, literature, education, or the arts.

IV. If any parts of the land or buildings occupied by any such Society shall be let for other purposes than those mentioned in section three, or shall be occupied as the residence of any officer or servant of the Society, such parts shall be assessed and rated as separate and distinct tenements for all purposes of county, borough, parochial, or other local rates and cesses.

V. The certificate directed by the recited act to be obtained from the lord advocate, or any depute appointed by him to certify the rules of Friendly Societies in Scotland, shall, from and after the *first day of September one thousand eight hundred and fifty-seven*, be applied for to and issued by the registrar of Friendly Societies in Scotland; and all the powers, duties, and provisions by the recited Act made applicable to the lord advocate or such depute shall be transferred to and be applicable to such registrar; and all the powers, duties, and provisions by the recited Act granted, imposed upon, or made applicable to the clerk of the peace for the borough or county, shall, in Scotland, be applicable to the sheriff clerk of the county where the lands, houses, or buildings of the Society are situate; and all the powers, duties, and provisions by the recited Act granted, imposed upon, or made applicable to the recorder or justices for the borough or county shall, in Scotland, be applicable to the sheriff of the county where such lands, houses, or buildings are situate, in the same manner and to the same effect as the same are by the recited Act made applicable to such clerk of the peace, recorder, or justices respectively.

VI. The certificate aforesaid shall be conclusive evidence that the Society therein named was, at the date thereof, a Society within the meaning of this Act, and no further evidence thereof than the production of such certificate shall be required by any court.

VII. If any such Society shall be conducted for purposes different from those set forth in the laws, rules, and regulations, after the same shall have been allowed and confirmed or filed, the exemption from rates and cesses by virtue of the said recited Act or this Act shall cease; but nothing herein contained shall prevent any such Society from applying for a fresh certificate as often as need be.

VIII. This Act and the said recited Act shall be construed as one Act.

NATIONAL MUSEUMS.

At page 173 of the present volume of the *Journal*, were published certain resolutions of the Council relating to this subject, and in accordance with them the following circular letter was issued to the Institutions:—

"Society of Arts, Manufactures, and Commerce,
"Adelphi, London, W.C., 16th February, 1857.

"Sir,—I am directed to request that you will bring before your Institution the following Resolution, passed at a special meeting of the Council of this Society, on Wednesday last, and inform me, as early as you can, what are the views of your Institution in reference to it.

"Resolved,—That the Secretary be instructed to inquire of the Institutions in Union whether they consider the time has arrived when, in order to give just facilities, throughout the United Kingdom, for acquiring knowledge in Art and Science, it is expedient that the National Museums situate in the Metropolis and elsewhere, such as the National Gallery, the British Museum, the Museum of Ornamental Art, the Museum of Practical Geology, and the public Museums in Ireland and Scotland, &c., which have already acquired, or may hereafter acquire, by Parliamentary votes, specimens of Art and Science should be rendered, as far as may be practicable, useful to the Local Institutions promoting Art Science, and Literature, throughout the United Kingdom, especially the Mechanics' and Literary Institutions in Union with the Society, and Free Libraries.

"Should it be the opinion of the Institutions that the time has arrived, the Council of the Society of Arts request that they may be favoured with opinions as to how the object may be best carried into effect, and the Council will be prepared to afford facilities for the discussion of the subject.

"Resolved,—That a copy of this Resolution be sent, not only to the Institutions in Union, but also to the Provincial Museums which may not be in connection with the Society, and to the Free Libraries of the United Kingdom.

"I am, Sir, your obedient servant,
"P. LE NEVE FOSTER, *Secretary*."

The following is an abstract of the replies which have been received :—

Bexley-heath Society.—Expresses its opinion in favour of the project.

Birmingham and Midland Institute.—Of opinion that the time has arrived when the National Galleries and Museums of natural history, &c., should be rendered available to provincial Societies. That casts and models should be furnished to such as are willing to pay a proportion of the expenses. That facilities should be afforded to a limited number of meritorious provincial students to attend lectures at the national institutions. That lectures should be delivered at the British Museum upon science, antiquities, and art. That assistance should be rendered to provincial Societies to enable them to ensure the services of competent curators. That copies of books, maps, plans, miners' records, patent specifications, if required, be presented to provincial Societies. That Government Mine-inspectors furnish shaft sections of all new mines, with specimens, if possible, of every stratum, rock, mineral and fossil met with in sinking the same. That Institutions should classify their duplicate specimens. That it would be desirable if arrangements could be made with the Royal, the Geological, and other learned societies for co-operation. That provincial Institutions should undertake, when required, to furnish the British Museum with specimens of mineral and fossil remains. That some competent person should be appointed periodically to visit and report the progress of such provincial collections.

Bolton Library and Museum.—Of opinion that the time has arrived when the national museums and National Gallery should be rendered useful to local institutions.

Bradford Mechanics' Institute.—Desires a fuller statement of the ideas and intentions of the Society.

Bristol Athenæum.—That collections of articles contained in the Metropolitan Institutions might be lent to Provincial Institutions for a definite term, and an application made to government for a grant to supply casts and photographs of remarkable works and specimens in the Metropolitan Institutions.

Bury Athenæum.—Favourable, but wait until the plan is further developed before they can advise.

Carmarthen Literary and Scientific Institution.—Not in a position to judge.

Cheadle Mechanics' Institution.—Favourable, but not prepared to offer any practical suggestion.

Chester Mechanics' Institution.—Their opinion as to the best mode of carrying out the object, is to grant the loan of works to Institutions for exhibition.

Chichester Literary Society.—Not in a position to give an opinion.

Clayton-le-Moors.—See Oakenshaw.

Cork.—Royal Cork Institution.—The opinion of the managers that the time has arrived when the National Museums, &c., ought to be made available for the Local Institutions. Suggest periodical exhibitions through the provinces of selected specimens.

Derby Mechanics' Institution.—Acknowledges receipt of Society's communication.

Greenwich Society for the Diffusion of Useful Knowledge.—Approve the objects. Will be prepared to send a deputation to take part in any discussion that may arise on the subject.

Hanley (late Shelton) Pottery Mechanics' Institution.—Suggests that copies, casts, &c., of articles of artistic merit, &c., be supplied to Institutions on the lowest terms possible. Also that the originals in the national collections should be rendered subservient to the same end, by portions of them—if they can be rendered available—being lent to Institutions to exhibit at a low charge. That lists of duplicate geological, &c., specimens, which are national property be published at brief intervals, and that the surplus specimens be furnished to Institutions, and that members of Institutions in union with the Society of Arts, shall have the privilege of free access to national museums or collections—for admission to which a charge is now made—on presenting their certificate of membership.

Hitchin Mechanics' Institution.—Favourable.

Holmfirth Mechanics' Institution.—Favourable; but not sufficiently informed to give an opinion as to the means of securing the desideratum.

Huddersfield Mechanics' Institution.—Suggest that members of Institutions in connection with the Society of Arts shall be able to enter the principal museum or galleries for the purposes of study by presenting certificates, dated in the current year, from the Institution to which the member may belong.

Larchfield, near Darlington.—Approval unanimously voted: left to a committee of three members to confer as to the best method of carrying out the intentions of the Society of Arts.

Lewes Mechanics' Institution.—Consider any means whereby the National Museums may be rendered more useful to the parties indicated highly desirable, but not prepared to offer any suggestion.

Lockwood Mechanics' Institute.—Suggest publishing descriptive and illustrated catalogues in a cheap form. Itinerating branch museums, entrance fee low. Gifts of superfluous specimens. Itinerating lecturers, paid partly by the Society of Arts and partly by local Institutions. Facilities for inspection of public museums, and persons in attendance to explain. Donations of superfluous books, diagrams, &c., to local Institutions.

London and South Western Literary and Scientific Institution.—Favourable. Suggest a meeting of delegates from the several Institutions.

Lowestoft.—Secretary promises to lay circulars before the committee of the St. John's Parochial Library and Reading Rooms.

Maidenhead Mechanics' Literary and Scientific Institution.—Favourable.

Morpeth Mechanical and Scientific Institution.—Favourable.

Newport Athenæum and Mechanics' Institute.—Favourable, but before offering any further opinion they would be glad to receive any suggestions showing in what way the idea may be rendered practicable.

Northallerton Institute. — Favourable. The "committee think that the idea may be best carried into effect by a sort of perambulating museum."

Northowram, near Halifax.—Unable to form an opinion.

Oakenshaw, near Accrington. — Clayton-le-Moors Institute.—Favourable.

Painswick Mechanics' Institute. — Favourable. "The experience of this committee convinces them that there is a desire, and a growing desire, on the part of many members, both of this and other institutes, for instruction, and also that the moral condition of our members is such that the government need be under no apprehension for the safety of any of those works of art, &c., which might be rendered serviceable to them." Suggest "that duplicates of objects might be sent to Institutes desiring them, according to priority of application, and at the expense of the Institutes so desiring them, and that railway companies might do much to help and encourage the spread of art, science, and literature, by conveying the members of Mechanics' Institutes, under certain restrictions, at reduced fares to these several museums, and it is the opinion of this committee that railway companies would neither be sufferers by such a plan, nor unwilling to lend such assistance to the studious artizan."

Pendleton Mechanics' Institution.—Press of business, incident to the opening of a new Institution, will prevent them from giving the circular consideration at present.

Peterborough Mechanics' Institution.—Of opinion that specimens of art and science in the possession of the national museums might be rendered of general use to local societies.

Plymouth Mechanics' Institute.—Favourable; but ask for further information.

Portsmouth and Portsea Literary and Philosophical Society.—"That the idea is not sufficiently definite to enable them at present to offer any suggestion upon the subject."

Preston Institution for the Diffusion of Knowledge.—Of opinion that it is highly expedient to render the treasures contained in the museums referred to in the resolution as easy of access as may be practicable to the local Institutions. Anxious to give every assistance in their power.

Radway (near Banbury) Institution.—Favourable.

Royston Institute.—Favourable. "An obvious advantage, which strikes the council at once, is the great service that might be given in raising local exhibitions of works of nature, science, and art."

Swansea Institution.—Suggest loan of duplicate or redundant specimens of objects of national science in the national museums, and copies of books in the national libraries, and also, for a limited time, or for a special purpose, of specimens, books, apparatus, diagrams, casts, models, &c., to the educational institutions of the provinces and local schools. Facilities for persons earnestly in pursuit of information for studying the contents of the national museums and libraries. That the lowest scale of fees be exacted from students of the economical applications of the sciences in the national schools of chemistry, mining, mineralogy, geology, &c., and that the most meritorious pupils of provincial Institutions have some advantages there, of the nature of scholarships or free teaching. That students in national schools be trained with a special view to qualification as teachers of the doctrines and practical uses of the sciences in classes established in provincial Institutions, &c.

Stafford Mechanics' Institution.—"Would prefer not giving any opinion."

Yarmouth Parochial Library and Museum.—Favourable. Suggest that duplicate specimens should be distributed gratuitously amongst the principal local museums. That travelling lecturers be appointed to districts, who should be furnished with such specimens as might be necessary. That exhibitions and lectures should be arranged periodically in various central towns.

SOUTH KENSINGTON MUSEUM.

This Museum will be opened on Saturday next, the 20th inst., by her Majesty the Queen, and the public will be admitted both in the daytime and the evening, on and after Wednesday, the 24th inst. Besides the various collections of architecture, sculpture, patented inventions, &c., the Sheepshanks pictures will be exhibited in the new gallery erected expressly to receive them. The admission of the public to the museum, lighted up in the evening, is the first experiment of the kind with a public institution, and it is hoped will be acceptable to those who work in the day-time.

The Committee of Council on Education, under whose direction is the Museum, have sanctioned the following rules for the admission of the public.

1. The collections of objects relating to education, architecture, and trade, of pictures, sculpture, ornamental art, and models of patented inventions, will be open to the public daily, from 10 till 4 in the day-time, and from 7 to 10 in the evening on Mondays and Thursdays, except during the appointed vacations.

2. On Mondays, Tuesdays, and Saturdays, and daily during the Easter and Christmas weeks, the public will be admitted free; but on these days, books, examples, models, casts, etc., cannot be removed for study.

3. On Wednesdays, Thursdays, and Fridays, the public will be admitted on payment of 6d. each person. This sum during the day-time will enable any person to consult any books, diagrams, etc., in the collections of education and to copy any article in the collections of art; except modern paintings, for which special permission in writing must be obtained. In the evening works cannot be removed. An annual ticket of admission to all the collections, morning and evening may be obtained for 10s.

4. Sticks, umbrellas, parcels, etc., must be left at the doors.

5. Except the fees above mentioned, no fee or gratuity is to be received by any officer of the department from any person.

6. The library of art is open every day from 11 a.m. to 9 p.m.; except Saturday, when it is closed at 4 p.m., and the usual vacations.

7. All registered students of the Central School of Art have free admission to the library. Occasional students are admitted upon payment of 6d., which will entitle them to entrance for six days from the day of the payment of the fee, inclusive: a monthly ticket may be obtained for 1s. 6d. and an annual admission for 10s.

8. Refreshments and waiting rooms in a special building have been erected, and presented to the public, by the commissioners for the Exhibition of 1851. They are under the management of Mr. G. Withers.

9. The General Omnibus Company have arrangements in progress to convey passengers to and from the Museum and all parts of the metropolis, every half-hour at least.

HELIOSCOPE.

Under this title Mons. Porro, the French astronomer, has just constructed a telescope of the Newtonian form, by which he is enabled to observe the sun without the intervention of a piece of darkened glass, (which is always difficult to obtain sufficiently pure and free from colour,) and without being inconvenienced by the heat, which in instruments of any magnitude soon destroys the darkened glass, and endangers the eye-sight of the observer. In the first telescope of this kind, which has been constructed under the direction of the inventor, the large mirror has an aperture of two decimetres and a focal distance of twenty-four decimetres. The excess of light and heat is got rid of by means of three reflectors, suitably arranged. The image of the sun thus obtained is perfectly white and well defined; the intensity of the light can be regulated at pleasure, and the heat is almost nothing at the eye-piece, so that the observer is enabled to work comfortably for many hours.

Home Correspondence.

SOCIETY OF ARTS EXAMINATIONS.

Sir,—I take the liberty of directing attention to some important matters, which will, in all probability, be brought under your consideration at the conference.

The examination scheme of the Society of Arts was established with special reference to the Institutions in union; it is now fairly before the public; it has had a fair trial, and has met with a large amount of sympathy and support. It is no longer a doubtful experiment, but an established fact.

You are aware that the work of the Examiners has been entirely gratuitous. Now, it is unreasonable to expect that professional men can give their time and attention year after year without some renumeration, if not to the full extent of their services, at least sufficient to establish that permanency and proper relationship which ought to exist between the Examiners, the Council, and the Institutions. As far as regards the Institutions, no pecuniary help can be expected from them. A very large number of Institutions are suffering from pecuniary difficulties, which have in some instances been accumulated for years. The Marylebone Free Library, now closed, the London Mechanics' Institution, founded by Dr. Birkbeck, and Crosby Hall, are all evidences of the great difficulty in sustaining these Institutions in a state of efficiency and usefulness. A certain source of income, however small, is much better than the fluctuations to which some localities are subject. The Institutions possess sufficient influence in many towns, if properly organised to ensure the adoption of Mr. Ewart's Bill; this would secure a small, but permanent source of income, and obviate, in a great degree, those difficulties which destroy good intentions and cripple the educational efforts of many Institutions.

A large number of Institutions do nothing towards preparing candidates for Examination; but every Institution with 200 members ought to have one or two classes for systematic instruction, and these classes might be carried on without interfering in the slightest degree with the ordinary lectures and arrangements, and, where it is possible, (and I am ready to believe these places very few,) a good day-school should be established, where the child of the artizan and mechanic could learn something more useful than what he finds in the generality of national schools. There should be a closer relationship between all the public educational Institutions of the same place. A great amount of power is lost by diffusion; this struck me as being particularly the case at Nottingham, and some other places. The late examinations seem to show that we must not expect many candidates who have passed 30 years of age. Our hopes and efforts must be chiefly directed to apprentices, clerks, and young men leaving school; and I think it will appear that the average standard of attainment this year is considerably in advance of the past. This is easily accounted for by the fact that in several places during the past year, a great effort has been made with special reference to the present. Examination classes at the Polytechnic were established entirely on the faith of these Examinations, and the subjects taught were those laid down in the Society's programme; some of the subjects were discontinued in the second term, because we had very few students; the largest classes were those in arithmetic, algebra, bookkeeping, chemistry, French and German. The other subjects, such as English literature (which is rather vague,) geography, and English history, are subjects which persons can read up by their own fireside. We never had any difficulty in getting attendance at these classes; some of the students came seven and eight miles. I never believed in the objection. We cannot get persons to attend. Depend upon it, it is not from any indifference on the part of the young men, but from defective power of the teachers, or bad arrangements on the part of the Institution; a zealous and enthusiastic teacher will sustain the interest of his class under many difficulties and discouragements.

There are four things essential for success in class teaching:

A comfortable room supplied with suitable apparatus.

Men who are good teachers selected if possible from the class they have to teach.

The terms of admission must be low.

There must be some definite object to work for.

The great value of material external influences has been very much overlooked in education. A cold, damp, miserable-looking cellar, under some chapel or railway-arch, is not a place to inspire any lofty sentiment or noble effort. If there is one room more dirty and cheerless than another, make that the class room. I was once offered a cellar in an Institution free of charge, if I would go to the expense of partitioning off the coals and laying on the gas. A cheerful fire, a tastefully-papered room, a good light, and soft seats, attract hundreds of men to the public house. The colour of the ceiling, the pattern on the walls, the cleanliness of the room, and the shape of the door handle, are all elements in the education of men as well as children, too important to be despised. If you would do anything in teaching, first get a comfortable class-room. The selection of teachers for some subjects would be rather difficult, but those subjects in which there is the largest number of candidates are the ordinary subjects of a National School, except French, Chemistry, and German. No place of any size can be without one or two good teachers, who would gladly undertake this work if you paid them liberally for their services. As a general rule, a gratuitous or cheap teacher is of no use except in a Sunday School.

If technical subjects are required, then several schools and Institutions should group themselves, and the teacher must go from one to the other, the same as the Art masters in provincial schools.

The terms of admission to a class must be influenced by local circumstances. Persons who are not members of the Institution should be admitted to the class on the payment of a small entrance-fee, but under any circumstances the fee must not be high. We had a fee of 5s. for each class at the Polytechnic. The first term commenced in September, and ended in January. The second term commenced in January, and ended the week before the Society of Arts examination. There were 16 lessons upon a subject in each term, each lesson occupying about one hour and a half.

I know some persons will say, do not make it too cheap; if you do, it will not be valued; but they forget that it is not the price, but the quality which makes it either cheap or dear. What extraordinary efforts are made by parents to get their children into schools where the education is entirely free—these schools are not the less valued on that account. If you fix a high price, you exclude young men and apprentices, who have only a few shillings at their disposal, and give some truth to the unanswerable objection, I cannot afford to attend the class. Before a man will make much sacrifice to obtain education, he must himself have enjoyed some of its advantages. It is idle to suppose young men will forsake the public-house and places of amusement for the class-room, unless there is some powerful motive—some tangible benefit to be gained. You may preach to young men about the beauties of Shakspeare, but they understand an increase of salary much better. You must deal with society as you find it. The higher motives to learning are not yet understood by the masses. Prizes may do something towards inaugurating a plan of examinations, but these rewards for exertions cannot last—the scheme must stand upon its own merits. Let the certificates of the Society be made a condition of promotion and success. Make education a necessity, and you will require no other stimulant to exertion. The time now spent by young men in listless idleness, or in a public-house, would be occupied with a view to their own advancement in life. The natural aptitude for business is strengthened by the mental training necessary for examination. The effort to solve an ordinary question in arithmetic is not without its commercial value.

Are those large employers of labour who have signed the declaration of confidence in the Society of Arts prepared to show their faith in this movement by filling up vacancies as they occur in their establishments (other things being equal), with men holding the Society of Arts certificates. Do this, and a great impulse would be given to education. The Mechanics' Institutes throughout the country would become centres of useful learning. Every man would understand that his own success in life depended mainly on himself.

An effort ought also to be made to obtain a certain number of free nominations for the public service. I think the Institutions in Union have a right to this, and their opinion on the subject should be represented to the proper authorities in plain and unmistakable language. The education of the country must claim for itself the right to those employments in the State for which the public pay. The system of patronage must not stand in the way of meritorious effort and self-sacrifice. Young gentlemen incapable of doing the public work must not sit in chairs to the exclusion of better men. I hope the conference will express an opinion on this subject.

The Institutions can command considerable local influence. The leading men of the neighbourhood subscribe to their funds, and support them in a variety of ways. There is a latent impression that there is something good in these Institutions, and that they may be turned to useful account. Every effort should be made to induce private establishments and public companies to fill up situations with persons who can show some evidence of mental as well as physical and moral aptitude.

Petitions should be got up by every Institution in union, and presented, by either the borough or county members, in support of the prayer contained in the petition presented to parliament by Colonel Sykes, the chairman of the Council. Classes should be formed, if only in one or two subjects; every Institution should make an effort to sent up one or two candidates at the next examination. The Society of Arts can do little without local co-operation and local effort. The unsatisfactory state of the law in reference to the rating of Institutions, has been a subject of discussion and complaint at every conference, yet how few Institutions have petitioned in sup-of Mr. Hutt's Bill. This indifference does not, I am sure, arise, as is sometimes thought, in the little interest which Institutions feel in the efforts of the Society. It would be well if some closer relationship could be established between the Society and the Institutions, beyond the mere meeting of delegates once a-year, and the circulation of the *Journal*.

The Secretary is the most important person in any Institution; he is, in most cases, an unpaid officer. The little time he has at his disposal is a few minutes snatched from business or recreation. If his duties, so far as the Institution is concerned, are neglected, if papers sent by the Society of Arts are not noticed, you cannot complain. The man works for nothing, and, in many cases, he would be glad of some one to relieve him of the duties altogether.

It must not be thought from this letter that I regard examinations in any other light than that of a powerful incentive to exertion, and a valuable means of education. The Society of Arts has before it a career of great usefulness. Time will show how it has fulfilled its mission. If it can reach the working classes and invest their daily toil with that dignity and sentiment which properly belongs to labour, but which cannot be realised in darkness and ignorance, its labour will not have been in vain. To refine their tastes and elevate their condition. not by doing things for them, but by teaching them to do things for themselves; to discipline the mind and give it the power of teaching as well as governing itself; to inspire the humblest with confidence to pursue paths open to the meanest as well as the highest; to withdraw the veil of ignorance, and reward the meritorious effort of the poorest; so far as it accomplishes, in the smallest degree, any of these objects, it promotes the true education of the people.

I am, &c.,
J. C. BUCKMASTER.

INCREASED SUPPLIES OF COTTON.

Sir,—The observations of Gen. Colebrooke on India contain so much that is valuable and practicable, that it is to be hoped they will induce others to follow up, in the *Journal of the Society of Arts*, a subject so important as the development of the resources of India.

I am glad to have the support of Gen. Sir William Colebrooke that railways in India will be available for the conveyance of cotton and other heavy goods, and that it is a mistake to assume they will not. This is a subject I worked out years ago, and the correctness of the data on which I proceeded has been confirmed by the progress of railway traffic. The mere cost of haulage forms only one part of the total cost of conveyance. The evidence placed in my hands by Sir Macdonald Stephenson, the Managing Director of the East Indian Railway, the late Mr. Heath, and the late John Chapman, the author of the "Cotton and Commerce" of India, showed that the cost of transport of cotton in small bullock hackeries was enhanced by waste, deterioration, theft, and loss of interest, so that in many parts of India the cost is carried to a shilling a mile, a sum enormous in proportion to the assumed cheapness of transport in India; nor is water transport advantageous in comparison with railway transport. A cheap and quick conveyance to market saves interest and secures a favourable price. There, is besides, one element in the question, which tends to give a permanent preponderance to the railway, and that is the rise in prices of labour and commodities which is taking place in India, and which will ultimately place Indian prices on a level with those of Europe. This is an economical process now in progress which has met with very little attention, but which is inevitable in its operation. Just in the same way as Ireland has been affected, and as the poorest countries in Europe are being affected, by the adjustment of prices, not to an average but to a maximum level, so will India come under the dominion of the same law. This, too, will be a great means for promoting the prosperity of India. Just as the Irish labourer and the small Irish farmer now enjoy comforts and luxuries unattainable in the era of low prices, so will the condition of the Hindoo labourer make him a better consumer, when receiving European wages, than when vegetating on a rupee a month.

The extension of the railway system, so far from being a diversion of capital from works of irrigation and canalisation, and inimical to them, will, in its development, become the most powerful engine for their promotion. What is wanted for those works of irrigation and canalisation is not foreign capital, but the right application of Indian capital. A railway, it is true, requires at present foreign rails, chairs, engines, and carriages, but a canal consists of Indian earth thrown up in mounds by Indian labour, fed with Indian rice. The surplus or unemployed labour of India, under proper direction, is sufficient to supply India with roads, canals, and water-courses, without any introduction of foreign capital, and with a very small amount of home floating capital. What is chiefly wanted is the free exercise of European enterprise, so that the resources of India may be turned to the best account.

As General Colebrooke shows, our permanent settlers in India can scarcely be counted by hundreds, and yet how much has been done by them for the improvement of India! Give these few the railway train, instead of the river boat or road palanquin, and you enable them to go over five or ten times the space of ground, and, in so far, to compensate for their paucity of numbers by increased activity; nor will the pecuniary results be inconsiderable. The railway fares of the European community will not amount to much, but the increased supply of cotton, indigo, sugar, jute, and other produce under such agency, will afford a vast and compensating revenue.

Bring European activity to bear on the cotton supply, and the cultivator will receive effective encouragement; the several classes of soil will, as General Colebrooke has intimated, be devoted to the kinds of cotton cultivation appropriate for them, and the exigencies of the home and foreign markets will be suitably complied with. Without railway communication, however, these desirable results cannot be anticipated. Let us take the case of the Morung, near Darjeeling, in which the indefatigable superintendent, Dr. Campbell, is engaged in promoting the growth of Sea Island cotton. A quarter of a century ago, there was no European, and only a wild aboriginal population scattered over the jungle, and such is the general condition of neglect of the great belt of the *Terai*. Now, by the exertions of the small English community of Darjeeling at the proposed terminus of the Northern Bengal Railway, cultivation generally has been extended, and tea planting has been successfully introduced. Give but efficient access to these regions, and on the healthy slopes of the sub-Himalayas an extensive European colonization can be established. Instead of the one small town of Darjeeling, there is no reason why the whole country should not be filled with towns and cities, inhabited by a healthy and thriving English population. Darjeeling, for instance, though 400 miles from Calcutta, needs only the construction of the 200 miles of the Northern Bengal Railway to place it in full railway communication with the seaport, and emigrants could be carried up cheaply and without danger to health. Emigrants at New York are carried 500 or 1000 miles up country, by emigrant trains, for five dollars, to Canada or Michigan, and for ten or twenty rupees the English mechanic would be carried from Calcutta to Darjeeling or Simla.

The Mahomedans, Gen. Colebrooke states, have left behind them their ten millions of descendants in India, but if we, as he urges, are to introduce permanent settlers, it must be in the healthy regions of the Himalayas and Neilgherries and not in the plains; and the seats of emigration must be made accessible, like Michigan, Canada West, Nebraska, or Kansas, by railways; and surely, if the wilderness of Michigan and Nebraska will pay for railways, India will pay.

One thing India wants is to be well known by the English public, and this can only be, by such channels as the Society of Arts and its *Journal*, and such communications as those of Gen. Colebrooke.—I am, &c.,

HYDE CLARKE.

42, Basinghall-street, E.C. June 8th, 1857.

NAUTILUS DIVING MACHINE.

Sir,—In the last number of the Society's *Journal*, a short report is given of the experiments with the Nautilus Diving Apparatus. As one of those present during the experiments, it occurred to me that if a simple electric telegraph wire were carried from the engine barge into the machine, additional safety would be afforded to the divers in case the air-tubes became separated from the machine, or from any unforeseen circumstance the compressed air in the chambers were unequal to lifting the machine. I venture to throw out this suggestion, and if you consider it worth the space it will occupy in print, perhaps you will insert it in the *Journal*.

I am, &c., A. B. C.

Proceedings of Institutions.

Basingstoke.—The sixteenth annual general meeting of the Mechanics' Institution took place on Monday evening, April 27th, at the Institution rooms, and attracted an unusually large attendance of members, who manifested the greatest interest in the proceedings. Among those present were W. S. Portal, Esq., the president, H. Downs, Esq., and Rev. W. B. Lightfoot, vice-presidents; R. S. Hulbert, Mayor, W. Challis, Esq., Rev. R. Hall, Messrs. B. O. Johnson, G. Franklin, James Smith, Lazenby, Elford, Dew, G. B. Mussellwhite, Maconochie, R. Nichols, &c. W. S. Portal, Esq., occupied the chair. The secretary read the report, which states that the present number of members is 250, being an increase of 12 in the year, and including a larger proportion of artizans, mechanics, &c., than at any previous time. The library consists of 1,617 volumes of instructive and useful literature, 58 volumes of which have been added by purchase, and 9 presented, viz., Ruskin's works, including "Modern Painters," "Stones of Venice," and "Seven Lamps of Architecture," presented by G. Sclater, Esq., M.P., and Bonnechose's "History of France," presented by the Rev. F. V. Thornton. The following lectures have been delivered since the last annual meeting:—The Earl of Carnarvon, "Historical Sketch of Hampshire." The Rev. J. S. Utterton, two lectures—On "Popular Manias" and the "Crusades, with some account of Chivalry and Don Quixote." The Rev. F. V. Thornton, three lectures,—on "The Great French Revolution." The Rev. M. Harrison, "Names of Persons, Christian and Surnames, their Origin, Whimsicalities and Inconsistencies." Rev. T. Bacon, two lectures,—"Rough Notes of a Tour in Norway." Mr. Hugh Wyeth, dramatic reading,—"Money." The Hon. and Rev. S. Best, "Sugar,—Its History and Preparation." The Rev. L. M. Humbert, "The Normans in England, and their Influence in Moulding Our National Character." Philip Sclater, Esq., "The United States and Canada." Elementary classes have been established during the past winter, with considerable success, by the aid of several ladies and members of the Institute, who have kindly given their services as teachers, for the purpose of imparting gratuitous instruction in reading, writing, and arithmetic, to the adult working classes of the town. The report of the reading-room and lending library, states that the issue of books during the year to the members has been 4,160, being an average of eighty per week. The financial position of the Institution is encouraging, showing a balance in hand of £210 2s. 3d., which, with a legacy of £100, recently bequeathed by the late patron and president of the Institution, C. E. Lefroy, Esq., will form a handsome reserve fund, towards obtaining, whenever opportunity offers, a more commodious and suitable building. The Chairman pointed out several of the most prominent transactions of the past year, and the encouraging position the Institution has now attained. The following members were elected as officers for the ensuing year, viz., *Patron*—The Right Hon. the Earl of Portsmouth; *President*—W. S. Portal, Esq.; *Vice-Presidents*—Rev. S. B. Wither, Rev. Matt. Harrison, R. Cottle, C. Simmons, G. Sclater, M.P., W. W. B. Beach, M.P., H. Downs, and R. S. Thilbert, Esqrs., and Rev. W. B. Lightfoot, and Rev. E. Geadon; *Treasurer*—Mr. W. Glover; *Secretary*—Mr. T. Beard; *Committee*—Messrs. Maconochie, G. B. Mussellwhite, Soper, Dew, Challis, Lazenby, Angell, Chandler, Easton, Pestell, Pidgeon, Vanner, Smith, Attwood, Hillier, and Klitz. The thanks of the meeting were voted to the gentlemen who kindly favoured the Institution with their valuable gratuitous assistance as lecturers during the past session. Also to the mayor. After passing other votes of thanks the meeting separated.

Brighton.—The committee, in presenting the sixth annual report of the Mechanics' Institution, state that at no period of its existence has its popularity been greater than at the present time. The number of members now on the books is 750. The funds are in a flourishing condition, and the enforcement of the fines has added materially to the revenue, having become a more important item this year than they were during last. The library is in a very efficient state; the number of volumes is now 3369, showing an increase (by donations and purchase) of 429 vols., to the donors of which thanks are due, especially to the last committee for their magnificent presentation of 150 volumes. The circulation of books during the past year has been very extensive, amounting to upwards of 1,400 volumes. The reading-room has been unusually well attended during the whole year. The classes in connection with the Institution are five in number, and have been well attended. The elocution and literary class is conducted by the Vice President, the Rev. A. J. Ross, to whom the Institution owes so much of its flourishing condition. Two classes on vocal music are conducted by Mr. W. Sturgess, who merits the best thanks of every member for the zeal and energy he has displayed in the good cause he has so ardently embraced. One class on arithmetic and algebra, conducted by T. W. Wonfor, Esq., who also merits many thanks for his services. One French class, which, during the winter, has numbered upwards of 60 students, and was conducted by Herr Syree, whose valuable services have been lately lost to the Institution by his departure for Africa, in company with the Bishop of Graham's Town, who is still a member of this Institution. The present teacher of the class is Mr. O'Calligan, who has given great satisfaction to the students. A cricket club has also been established in connection with the Institution. A testimonial has been presented to the Rev. A. J. Ross, for the eminent services he has rendered the Institution. During the lectures and musical entertainments the room has generally been densely crowded, and on some occasions hundreds have been unable to gain admittance. To this department the Institution is greatly indebted for the flourishing state of its funds. The following is a list of the lectures and entertainments during the past year, twelve having been delivered gratuitously:—"Grand Musical Entertainment," Misses Mascall; "The Rise and Progress of Literature and Science in England," Mr. Montgomery; "Ludicrous in Life," G. Grossmith, Esq.; "Musical Entertainment," A. Fairbairn, Esq., and Misses Bennett; "Lecture on Music," J. Edney, Esq.; "The Nature of the Belief of the Ancient Greeks in a Future State of Rewards and Punishments," Professor Creasy; "Local Facts for Popular Education," Rev. J. Griffith, M.A.; "Recollections of the Opera," Mr. and Mrs. Cooper; "Chaucer," Rev. A. J. Ross; "The Romance of the Law Courts," W. Parsons, Esq.; "Chaucer," Rev. A. J. Ross; "Musical Entertainment," Sig. Bianchi, &c.; "Historical Plays of Shakspere," Rev. F. Maurice; "The Road, the River, and the Rail," Mr. Carpenter, and Misses Mascall; "Local Facts," (concluding lecture) Rev. J. Griffith, M.A.; "Astronomy," M. L. Phillips, Esq.; "English Notions of American Character," G. Grossmith, Esq.; "Musical Entertainment," Madame Sala, and the Brighton Madrigal Society; "New Zealand," W. Mantell, Esq.; "Ancient Pictures and Modern Painters," M. Penley, Esq.; "Old English and Patriotic Songs," G. Buckland, Esq.; "Tower of London," E. Cox, Esq.; "Musical Entertainment," Mr. and Mrs. Cooper; "Dr. Samuel Johnson," W. Parsons, Esq.; "Musical Entertainment," Mr. and Misses Edney. Thanks are due to the following ladies and gentlemen for their valuable services:—Madame Sala, Revs. J. Griffith and A. J. Ross, Professors Maurice and Creasy, Herr Kuhe, M. L. Phillips, M. Penley, W. Mantell, and E. Cox, Esqrs., Messrs. S. Gates, W. and R. Devin, Goldsmith, Hewitt, and the members of the Brighton Madrigal Society; and to the Mayor (I. G. Bass, Esq.), Rev. J. Ross, Cordy Burrows, and Barclay Phillips, Esqrs., for services rendered at the Soirée. The following gentlemen have been elected officers for the present year:—*President*—The Most Noble the Marquis of Bristol; *Vice Presidents*—J. Cordy Burrows, Esq., Rev. J. Griffith, M.A., F. Merrifield, Esq., Rev. A. J. Ross; *Hon. Vice-Presidents*—Admiral Sir G. B. Pechell, M.P., Lord Alfred Hervey, J. Andrews, Esq., C. J. Bond, Esq., Mr. Alderman Burn, Mr. Alderman Cobb, A. Cobbett, Esq., Herr Kuhe, S. Laing, Esq., P. O'Brien, Esq., M. Penley, Esq., M. L. Phillips, Esq., P. Salomons, Esq., T. W. Wonfor, Esq.; *Treasurer*—I. G. Bass, Esq., (Mayor); *Trustees*—C. Carpenter, Esq., W. Coningham, Esq., M.P., W. Kirkpatrick, Esq., J. Lawrence, Esq., J. Rogers, Esq., M. D. Scott, Esq.; *Auditors*—Mr. Coppard, E. Cornford, Esq., Mr. C. Stone; *Committee*—Mr. J. Attwick, Mr. Bryan, Mr. Child, Mr. J. Feist, Mr. Griffiths, Mr. J. Saunders, Mr. H. Scrase, Mr. Smith, Mr. Venner; *Secretary*—Mr. James Howell; *Librarian and Collector, pro. tem.*—Mr. Crocker.

To Correspondents.

ERRATUM:—In the last number but one of the Journal, page 425, col. 2, line 22, for "nitrogenous" read "heterogeneous."

MEETINGS FOR THE ENSUING WEEK.

MON. Geographical, 8½. I. Lieut.-Col. Grant, "A Description of Vancouver's Island." II. "Extracts from the Proceedings of the North Australian Expedition." III. Dr. Macdonald, R.N., "Report of the Expedition for the Exploration of the Rewa River and its tributaries."
TUES. Society of Arts, 11. Distribution of Prizes. 6. One Hundred and Third Anniversary Dinner, at the Crystal Palace.
Med. and Chirurg., 8½.
Zoological, 9.
WED. Society of Arts, 10. Conference of Representatives of Institutions in Union. 4. Annual General Meeting.
Royal Soc. Lit., 4½.
THURS. Royal Society Club, 6. Anniversary.
Numismatic, 7. Anniversary.
FRI. United Service Inst., 3. Lieut.-Col. Dixon, "The Rifle and its probable influence on Modern Warfare."

PARLIAMENTARY REPORTS.

SESSIONAL PRINTED PAPERS.

PAR. NO.

Delivered on May 29.

28 (1). High Sheriffs (Ireland)—Correspondence.
50. Metropolis Turnpike Roads—31st Report of the Commissioners.

Delivered on 30th May, and 3rd and 4th June.

8. Cambridge University—Copies of Two Statutes.
9. Oxford University—Copies of Three Ordinances.
51. East India (Madras Presidency, &c.)—Papers.
38. Civil Services, Estimates—Classes 1 and 2.
46. Foreign Sugar—Account.
47. Sugar—Return.
62. Enfield Factory—Account.
55. Fisheries (France)—Copy of an Order in Council.
57. Malt, &c.—Return.
64. Mercantile Marine Fund—Return.
65. Court of Session (Scotland)—Return.
26. Local Acts—Admiralty Reports—(41), Fraserburgh Harbour; (42), River Slaney Improvement.
36. Bills—Protection of Female Children and Idiots.
37. ——— Savings Banks (No. 2).
38. ——— Joint Stock Companies' Act Amendment.
39. ——— Turnpike Trusts Abolition (Ireland).
Superannuation Act—Report of the Commissioners.

Delivered on June 5.

38 (3). Civil Services, Estimates—Class 3.
63. Ordnance Survey (Scotland)—Return.
33. Bill—Medical and Surgical Sciences (Queen's University) (Ireland).

Delivered on June 6th and 8th.

33. East India (Opium)—Further Returns.
56. Tobacco—Return.
58. National Collections—Return.
59. Public Works (Ireland)—Account.
61. Spirit Licenses (Ireland)—Returns.
67. Dover Mail Packet Contract—Return.
68. Ecclesiastical Commission (Ireland)—Return.
69. Income-tax—Return.
60. Public Works Loan Commissioners—Account.
70. Foreign Shipping—Account.
73. Savings Banks—Return.
26. Local Acts—Admiralty Reports—(43), Borough of Portsmouth Improved Water Supply; (44), Orkney Roads.
34. Bills—Tenant Right (Ireland).
35. ——— Scientific and Literary Societies.
42. ——— Alehouse Licensing.
43. ——— Burials.
44. ——— Married Women's Reversionary Interest.
41. ——— Joint Stock Companies (amended).
46. ——— Court of Exchequer (Ireland).

FIRST SESSION, 1857.

137 (1). Poor Relief—Further Return.

Delivered on June 9th.

45. Bill—County Cess (Ireland).

Delivered on June 10th.

38. Civil Services Estimates—Classes 4 and 5.
71. East India (Nawab of Surat)—Return.
48. Bills—Joint Stock Companies Act Amendment (amended).
51. ——— Sound Dues.
Persia—Correspondence.
Persia—Treaty of Peace.

Delivered on June 11th.

72. Loan Societies—Abstract of Accounts.
75. Registration of Voters (Scotland) Act—Return.
80. Courts of Law (Dublin)—Copies of Letters.
82. Guano—Correspondence.
88. Church Rates—Return.
47. Bills—Probates and Letters of Administration.
49. ——— Pimlico Improvements.
53. ——— Reformatory School.
55. ——— Inclosure Acts.
58. ——— Militia (Ireland).

Delivered on June 12th.

26. Local Acts—Admiralty Reports—(45), Wexford Free Bridge; (46), Norfolk Estuary Acts Amendment.

78. Army (Sums Paid to Relatives of Officers in lieu of Pensions, &c., &c.)—Return.
81. Court of Chancery (Ireland)—General Orders.
84. Savings Banks (Number of Depositors, &c.)—Accounts.
85. Savings Banks—Return.
50. Bills—Public Offices Extension.
54. ——— Grand Juries (Metropolitan Police District).
57. ——— Charitable Uses.

Delivered on June 13th and 15th.

66. Riff Pirates—Return.
90. Incumbered Estates Court (Ireland)—Correspondence.
95. Railway and Canal Bills—Fourth Report of the General Committee.

PATENT LAW AMENDMENT ACT.

APPLICATIONS FOR PATENTS AND PROTECTION ALLOWED.

[*From Gazette*, *June* 12.]

Dated 20th March, 1857.

778. Joseph François Maire, 36, Rue de l'Echiquier, Paris—An improved cooking apparatus, producing a saving of fuel and time.

Dated 30th March, 1857.

874. John Horace Taylor, 24, Alma-street, Hoxton—Improvements in apparatus for regulating the flow of fluids applicable to waterclosets and other similar purposes.

Dated 30th April, 1857.

1213. Henry Ball, Great Russell-street, Birmingham—Improvements in repeating and other fire-arms.

Dated 5th May, 1857.

1263. Louis Le Chevalier Cottam, Winsley-street, Oxford-street—Improvements in stable fittings.
1270. William Wilkins, Wapping—An improved method of laying submarine telegraph cables.
1272. Henry Elliott Hoole, Green Lane Works, Sheffield—Improvements in stove grates.

Dated 19th May, 1857.

1403. Charles Reeves, Birmingham—New or improved grinding and polishing machinery, to be used in the manufacture of knives, matchets, swords, and other similar articles.
1409. John Watson Burton, and George Pye, Ipswich—An improvement in pressing and crushing flax, hemp, and other fibrous substances.

Dated 20th May, 1857.

1415. Paul Ingwersen, 452, New Oxford-street—A certain remedy to prevent and dissolve the deposits in boilers and steam generators. (A communication.)

Dated 22nd May, 1857.

1443. William Hensman, Linslade, Buckinghamshire — Improvements in drills for sowing seeds and depositing manure.
1449. John Ralph Engledue, and William Cullis, Southampton—Improvements in ventilators for ships' cabins, apartments, and places.

Dated 27th May, 1857.

1481. James Edgar Cook, Greenock, N.B.—An improved composition for the prevention of the decay and fouling of ships' bottoms and other exposed surfaces.
1485. William Stettinius Clark, 133, High Holborn—Improvements in printing presses. (A communication.)
1487. William Stettinius Clark and Benjamin Moore, 133, High Holborn—Improvements in churns for producing butter. (A communication.)
1489. Robert Parkinson and John Standish, Blackburn—Improvements in machinery or apparatus used in the preparation of cotton, wool, flax, or other fibrous materials to be spun.
1491. William Irlam Ellis, Vulcan Foundry, near Warrington—Certain improvements in steam engines.
1493. Robert Low, Union-street, Woolwich, and William Press, Stepney Causeway—A certain new improvement or new improvements in the construction of vices.
1495. Edward Welch, Penge, Surrey—Improvements in fireplaces and flues, and apparatus connected therewith.
1497. Jean Léonard Codet-Négrier, Paris—Improvements in the manufacture of boots, shoes, harness, and other articles.
1501. John Williamson and Francis Williamson, Keighley, Yorkshire, John Wright, Griffe Mill, Haworth, Bradford, and Joseph Wadsworth, Oldfield, Keighley—Improvements in looms.
1503. Ferdinand Jossa, St. Helen's Colliery, near Bishops Auckland, Durham—Improvements in hammers worked by atmospheric pressure.
1505. Milivoi Petrovitch, Belgrade, Servia—The improvement of projectiles used with fire-arms.
1507. Thomas Taylorson Jopling, Dunning-street Foundry, Sunderland—Improvements in water gauges of steam boilers.
1509. Richard Edward Hodges, Southampton-row, Bloomsbury—Improvements in gauges and scales.
1511. William Edward Newton, 66, Chancery-lane—An improved method of applying photography to the use of engravers. (A communication.)
1513. Thomas Hart, Watt's-terrace, Old Kent-road—Improvements in the manufacture of lamp glasses, applicable to railway carriage and other lamps.

Dated 28th May, 1857.

1515. Alexander Simpson, 77, Chaacery-lane—A new or improved slop and toilet pail. (A communication.)

Dated 29th May, 1857.

1519. Jean Salles, Paris—An improved apparatus for printing and stamping.
1521. James Merrylees, Paisley—Improvements in the manufacture or production of carpets and other ornamental fabrics.

Dated 30th May, 1857.

1525. Pierre Benoit Chapuis, 3, Place des Repentirs Guilliotiere, Lyons, France—Improvements in machinery for manufacturing ribbons, trimmings, fringes, and healds.
1527. Moses Clark, St. Mary Cray, Henry Oldfield, Foots Cray, and William Salmon, Foots Cray, Kent—Improvements in machinery or apparatus used in the manufacture of paper.
1529. Lewis Fenton Kenny, Stanley-street, Pimlico—Improvements in window frames and sashes.
1531. Ralph Errington Ridley, Hexham, Northumberland—Improvements in the permanent way of railways.
1533. Ferdinand Charles Warlich, Hope cottage, Kentish-town—Improvements in generating steam.
1535. George Hornsey, Southampton—Improved apparatus for the engine rooms of steam vessels for communicating signals and orders from the captain on deck to the engineer or attendant below.

Dated 1st June, 1857.

1538. Lazare Prosper Lambert-Alexandre and Louis Pierre Felix Mallet, Paris—Improvements in machinery for propelling vessels.
1539. Frank Perks Fellows, Wolverhampton—Improvements in the manufacture of hinges, cocks, and other jointed articles, or articles of which one part is required to be capable of turning upon, or in another part of the same article.
1541. John Aiken Salmon, Glasgow—Improvements in steam engines, and in apparatus for feeding boilers and in furnaces.
1542. Louis Laurent Bequemie, 30, Rue de la Douane, Paris—Improvements in cocks. (A communication.)
1543. George Tingle, Northwood, near Hanley, Staffordshire—An improvement or improvements in machinery for the manufacture of articles from clay and other plastic substances.
1545. Henry Thompson, 322, Regent-street—Improvements in pianofortes.
1546. Thomas Slater, Finkee-street, Hull—An improvement in ploughs.
1547. Stanislaus Hoga, 1, Marylebone-street—An improvement in coating the surfaces of the cells of galvanic batteries, and also the surfaces of crucibles.
1549. Henri Laurent Muller, junr. Paris—A new means of advertising.

Dated 2nd June, 1857.

1551. William Stettinius Clark and Benjamin Moore, 133, High Holborn—Improvements in animal traps.
1552. Peter Armand le Comte de Fontainemoreau, London, Paris, and Brussels—Improved means of floating submerged bodies. (A communication.)
1553. Newton Bentley, Salford, and John Alcock, Little Bolton—Improvements in machinery or apparatus for forging and stamping metals, which is also applicable to pile-driving, crushing ores and seeds, beetling and fulling woven fabrics, and other similar purposes.
1554. James Allen and John Gibson, Manchester—An improved union joint.
1555. James Stevens, Darlington Works, Southwark Bridge-road—Improvements in water gas meters.
1556. Nicolino Corrado, 4, Cardington-street, Hampstead-road—Improvements in purifying fatty matter.

INVENTIONS WITH COMPLETE SPECIFICATIONS FILED.

1612. John Gedge, 4, Wellington-street South, Strand—Improvements in constructing gas retorts in the furnaces of steam engines, or other furnaces. (A communication.)—9th June, 1857.
1617. Thomas Hale, Massachusetts, U.S.—A new and useful or improved apparatus for heating and ventilating a building. (A communication.)—9th June, 1857.

WEEKLY LIST OF PATENTS SEALED.

June 12th.

2963. John Smith.
2965. John Metcalf.
2976. Charles Frederic Vasserot.
2980. Frederick Wm. Gerhard.
2988. John Platt.
35. Thomas Forsyth.
151. Nicolas Fortune.
648. John Woodley and Henry Herbert Swinford.
929. David Joy.
1059. Alfred Vincent Newton.
1091. Gabriel Arthur.

June 16th.

2975. William Austin.
2995. Francis Barber Howell.
3003. John Brown.
3018. Thompson Newbury.
3028. Thomas Lyon Thurlow.
3035. William Smith.
3062. David Macdonald.
3082. George Ritchie.
389. John Forest Watson.
836. John Henderson.
863. William Ross.
1069. Thomas Richardson.

PATENTS ON WHICH THE STAMP DUTY OF £50 HAS BEEN PAID.

June 9th.

1318. George James Hinde.

June 11th.

1319. Robert Reeves.

June 12th.

1462. Jean André Cecile Nestor Delpech.
1519. Victor Gustave Abel Cuvier.

June 13th.

1299. Thomas Wilson, and John Hadley.
1303. John Davie Morries Stirling.

Journal of the Society of Arts.

FRIDAY, JUNE 26, 1857.

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DISTRIBUTION OF PRIZES.

The Prizes awarded by the Society's Examiners at the examination held in London during the first week of June, were distributed to the successful candidates on Tuesday morning last, the 23rd instant, at 11 o'clock. The Right Honourable Sir John Pakington, Bart., M.P., presided.

The Secretary read some extracts from the Reports of Examiners, which will be found at page 457.

The Chairman said he had, with very great pleasure, complied with the request that had been preferred to him to take the chair upon the present occasion, because he felt very happy at all times to fill any part which might show the very deep and sincere interest which he, for one, felt in that great question of national education which was now, he was happy to say, exciting great interest in the country. If he told them that, in consequence of the very numerous avocations which pressed upon him, he was, perhaps, less acquainted with the details of the system pursued by this Society than he ought to be, he felt that any such deficiency on his part had been rendered unimportant by the very interesting statement which they had just heard read by the secretary. He thought that statement taught them two things at least, one of which was, that it was quite clear that the system established by this Society—that part of it, at least, which they were now considering—was well devised and well adapted to its end, and the other, perhaps, still more important, and with which they had to deal more distinctly, was the debt of gratitude which this Society undoubtedly owed to those able and benevolent men who had given the advantage of their abilities, and who had so kindly devoted their time to fulfilling the office of the Examiners. He thought it was not necessary to detain them at any length with his opening observations, especially as the cause of education could not be advanced by mere speech-making. If eloquence could educate the people, they would have been educated long ago. There was a vast number of very enthusiastic educationists, who seemed to think that the end they had in view could be accomplished by platform oratory year after year. He was of opinion that they had had enough of this, and what he desired to see was, action rather then eloquence. He could not help remarking, that they were assembled at a moment peculiarly appropriate for the object which had brought them together. They were assembled on the middle day of the three which had been devoted to a conference upon one important branch of this great question of education. His earnest hope was that that conference might not end in the mere speech-making to which, no doubt, the subject would give rise, but that it would prove—as he believed it would prove—of value by leading to something like energetic action. He believed that a conference, under such auspices, could not fail to excite general interest in this great question, and would tend to disseminate more widely that information which he believed still to be largely wanted on this subject. The objects of the conference thus assembled were very closely connected with those which had brought them together. The great question of education had many branches and many parts, and it was very difficult to say which of the defects in the present system was the most prominent and important; but, undoubtedly, that evil which the Educational Conference was assembled to consider was one of the most prominent and important, viz., the very early age at which, from different causes, children ceased their attendances at school. Now, in considering the question, of course men of sense—men who wished to be practical—must consider what were the remedies—and he believed they were various—which might be afforded; but this, at all events, was most clear, that the first duty was to offer every possible inducement for the children remaining at school for a longer period than was now generally the case. Now, many inducements had been considered and carried out. They were told in one direction that nothing was so certain—nothing was so efficient, as the system of certificates, in order to give a well-conducted and a well-educated boy a claim to employment in virtue of the certificate of proficiency which he possessed. He thought there was much force in that view. Another view was, that nothing would stimulate the rising generation—that nothing would act so strongly on the minds, either of the children or parents, as the system of prizes. His own belief was that, so far as those two incitements would operate alone, he did not believe they would be sufficient. As an auxiliary, each might be valuable, but he believed the way to make them most valuable was to combine the two,—to adopt a system both of certificates and prizes. He found that that had been the system adopted by the Society of Arts, in the efforts which, to their great honour, they were now making, to give a stimulus to the education of the country. And here let him remark that the aims of the Society of Arts were now directed to that particular portion of the citizens of this country who, after all, he believed, stood in a worse position with regard to education even than the vast masses of their labouring fellow-men—he meant the middle classes. The middle classes, he considered, stood greatly in need of educational assistance, and it was for their especial benefit that the Society of Arts were directing their laudable efforts. He could not help reminding them that he regarded it as one of the hopeful and healthful signs of the times that, although there was much which excited their regret as citizens, and their disapprobation as men, with reference to the education and training of the working-classes of the community, still they did see signs around them of an improved feeling in these respects, and that there was a growing desire in the country to supply the deficiences that exist, and to revert, if possible, to a more healthy state of things. He might adduce, in proof of this statement, many instances—to one or two of which only he would advert. First of all he would allude to the step which had at length been taken with regard to the training of our military officers. In this particular they had had great neglect to lament. During a forty years' peace they had been indulging in the belief that their armies were still the best in the world; and, dwelling on the glorious recollections of the days of Wellington, they had believed that nothing could cope with the British soldier. It must be allowed that so far from a lengthened period of uninterrupted peace having enervated our race, the gallantry and bravery of the Anglo-Saxon were as great as ever. During the late war they heard of incidents of the most extraordinary bravery, on the part both of officers and private soldiers, which showed that the advancing civilisation of the age had not enervated the national character in the smallest degree. They had, however, learnt that other nations had been availing themselves of peace to cultivate the science of war. They had been told that, brave as were their officers, something more than bravery was required if they wished to have an army what it ought to be—and that therefore the men entrusted with the higher departments of the service must receive a proper education and training for the service for which they are destined. He was also happy to remark that the same principle had at length been recognised in the appointments in the Civil Service of the country, which were now no longer dispensed as mere matters of patronage by persons in power, but were made dependent upon the qualifications of the person seeking an appointment of that nature. It was also gratifying to remark the system which had been of late introduced into the ancient universities of the nation. Going still further, he was happy to note, as an encouraging sign of the times, that the eating of a certain number of dinners in one of the Inns of Court was no longer deemed a sufficient qualification for members of the bar, but that examinations of a very searching description were now a necessary preliminary to admission into that profession. The right hon. gentleman then adverted to the proofs of the great ignorance which still prevailed amongst the middle-classes of society which were furnished by the examinations of candidates for appointments in the Civil Service, showing as they did the great need of education in that direction. Under these circumstances, he added, it was gratifying to find how much had been already done, although it only served to open out before them a more extended and wider scope of action. He expressed his opinion that the best results might be anticipated from the Union of Mechanics' Institutes, all over the country, with the Society of Arts—dwelling upon the advantages which those Institutions would not fail to derive from such an union. Reverting to the occasion which had brought them together, he was happy to have observed that a standard of proficiency had been established by the Society, and that all who reached that standard had an equal claim to the certificate of the Society, which had in each case been awarded. He also expressed his gratification at seeing that the candidates for honours were not confined to mere youths, but numbered amongst them men from 20 to 30 years of age, who had set themselves to work to improve their educational position. Whilst, however, he drew attention to the hopeful signs of the times which were springing up around them, he could not but regret the humiliating position which this country must assume in regard to its educational status, when compared with some other nations around them, and particularly with some of the vast and growing colonies embraced within her Majesty's dominions. He had been much struck with some able remarks which appeared in a pamphlet, which a few days ago was put into his hand by the Chief Justice of Upper Canada, who was on a visit to this country, in which there appeared a paragraph, giving the educational statistics of the colony, which might well make them blush for the cause of education in this country hitherto. The paragraph to which he alluded was as follows:—

> "The educational statistics of Upper Canada may be thus summed up:—In 1855, there were in actual operation 4 Universities, 6 Colleges, 65 Grammar-schools, 29 Private Academies, 278 Private Schools, and 3325 Common Schools, making in the aggregate 3707 educational institutions, teaching 240,817 pupils and students, and costing the country, in great part by self-imposed taxation, £230,000 sterling."

He thought these few remarks would not be inappropriate to the present occasion, and if anything could stimulate the mother-country to efforts on this question, it would be found in the fact that, unless they vigorously bestirred themselves, our own colonies would far outstrip us in their educational position and its concomitant advantages. Having again expressed his high sense of the exertions of the Society of Arts in the cause of education, and having paid a well-merited tribute to the personal labours of Dr. Booth in that cause, the right hon. gentleman resumed his seat amidst much applause.

The Rev. Dr. Booth said—Sir, it now becomes my duty to present to you those candidates to whom prizes have been awarded, and before doing so, I should be glad to make one or two observations. In the first place, looking to the importance of promoting the general elementary education of the country—a perfect familiarity with the very rudiments of instruction—the Board of Examiners instituted a previous examination in handwriting, spelling, the common rules of arithmetic, and in correcting faulty English composition. To this preliminary sifting every candidate without exception was subjected, before he was permitted to go into examination in any of the special subjects laid down in the programme. The Board of Examiners attach great importance to this regulation. They believe it to be of the utmost utility that the attention of the candidates should in the first instance be directed to the attainment of a sound common English education, and, that being to a great extent secured, they should go on to those special subjects for which they have a natural aptitude. The Board of Examiners are glad to report that the rejections for incompetency on these grounds are very few indeed. Again, it may be surmised, by those who are not acquainted with the stringent rules laid down by the Examiners, and who see the large number of certificates even of the first-class awarded to the candidates, that a considerable latitude and profusion in their distribution exists. Now, I say distinctly and emphatically, and I speak in the presence of those who know it to be true, that the Board of Examiners came unanimously to the decision, even if they were to award no certificate at all, that it would be better, and wiser in the end, not to lower the intrinsic value of their certificates; that they should lay down a fixed standard, and that every one who came up to the standard should have his certificate, no matter how many others might be successful. It must always be borne in mind that our examinations are absolute, not competitive examinations. The certificates are the honours of the Society of Arts; the prizes, which are the only competitive feature, are contributed by individuals who take an interest in the success of the scheme. With these few observations I will now call up the candidates in their order.

The successful candidates were then introduced by the Rev. Dr. Booth, Chairman of the Board of Examiners, to Sir John Pakington, who presented them with their respective prizes.

A list of the names of these candidates will be found in the Appendix (page 459) to the Secretary's Report read before the Conference.

A vote of thanks was then passed to Sir John Pakington, which was duly acknowledged.

ONE HUNDRED AND THIRD ANNIVERSARY DINNER.

The One Hundred and Third Anniversary Dinner of the Society, took place at the Crystal Palace, Sydenham, on Tuesday, the 23rd of June. Nearly 300 gentlemen were present on the occasion. The chair was taken by Lord Stanley, M.P., who was supported by General Sir Charles Pasley, K.C.B., Mr. Chief Justice Draper, Mr. Justice McDougall, Messrs. Roche, J. Platt, M.P., E. Akroyd, M.P., Sir Joseph Paxton, M.P., T. A. Tefft (United States), Charles Wentworth Dilke, A. Anderson, J. Scott Russell, F.R.S., H. G. Bohn, J. Cassell, Professor Mariette, Rev. Professor Brewer, Rev. Professor Browne, Mons. Stievenard, J. W. Gilbart, F.R.S., Captain Ibbetson, Lieut. Hanmer, Dr. Waddilove, J. Griffith Frith, C. F. Audley, J. G. Appold, F.R.S., &c., &c.

The centre cross-table was occupied by the members of the Council of the Society, including Messrs. Matthew Marshall, Peter Graham, Thomas Winkworth, G. F. Wilson, James Glaisher, F.R.S., W. B. Simpson, W. Mackrell, Rev. Dr. Booth, F.R.S., Francis Bennoch, Joseph Glynn, F.R.S., with Colonel Sykes, M.P., F.R.S., Chairman of Council, as Vice-Chairman.

At the Art table were, among others, A. C. Ionides, E. C Bicknell, J. Bell Sedgwick, Henry Bradbury, A. Blundel, J. Leighton, G. Leighton, J. Murray, Henry Mogford, A. Pearce, E. C. Bicknell, T. Dennis Chantrell, Thomas Page, John Coe, with Professor Donaldson as Vice-Chairman.

At the Commerce table were, among others, J. E. Carlisle, Charles Hill, E. Wilson, H. Chater, C. Kingsford, T. Kingsford, Leo Schuster, J. K. Lavanchey, G. N. Hooper, Conrad Wetter, J. Vavasseur, A. E. Rae, C. Meeking, R. L. Chance, with William Brown, M.P., as Vice-Chairman.

At the Colonial table were, among others, H. J. Castle, P. L. Simmonds, Hyde Clark, R. Escombe, J. Alger, H. J. Byron, Leone Levi, with Mr Chief Justice Temple as Vice-Chairman.

At the Institute table were, among others, Dr. Humphreys, G. Edmondson, Rev. Muirhead Mitchell, W. McIvor, Rev. W. Taylor Jones, J. W. Bontoft, F. J. Macaulay, R. Dawbarn, W. Britton, R. Crosskey, with Mr. Arthur Ryland as Vice-Chairman.

At the Agricultural and Mechanics table were, among others, Messrs. Sheriff Mechi, W. Fothergill Cooke, Thomas Scott, James Beadell, J. Lockhart Morton, T. H. Bastard, F. Laurence, T. R. Crampton, W. B. Adams, E. Highton, Robert Davison, H. Hensman, A. C. Hobbs, W. Smith, Thomas Webster, F.R.S., with Mr. James Caird, M.P., as Vice-Chairman.

Grace having been said by the Rev. Professor Browne,

The Chairman (who was received with protracted applause) rose and said—The character of the Queen was so well-known to all in the room, and he believed he might say to all in the country, that he would be almost justified in proposing the health of her Majesty without one word of preliminary remark. Only this he would say, they all of them knew that in the present age, as compared with past times, there had been a considerable diminution in the direct political power of the crown; but, notwithstanding that diminution, they were all aware that never was there a reign in which the social influence of the crown was greater than at the present time—and why? Because never before was that influence so uniformly and so beneficially exerted in favour of all measures of true social progress, and in favour of educational reforms—using the word "educational" in its widest and truest sense. He begged to propose to them, in the usual manner, "the health of her Majesty the Queen." (Drunk with three-times-three.)

The Chairman again rose and said—The next toast upon his list was, the health of his Royal Highness Prince Albert, and as it was a pity that near relatives should ever be separated, he proposed to couple with that toast the health of his Royal Highness the Prince of Wales and the rest of the Royal Family. Prince Albert, as they were aware, was the President of the Society of Arts; but it was not merely on account of a formal and nominal patronage that he had claims upon their regard. He had attended their meetings—he had taken part in their proceedings. Only yesterday (and in the present hot weather, the performance of even necessary public duties had much more of labour than pleasure) his Royal Highness passed the greater portion of the day in presiding over an educational conference, the object of which was to provide for the removal of those obstacles which impede the efficient instruction of the young; and when a volume of his addresses, which he believed would shortly appear, was made public, every Englishman would have an opportunity of seeing—what many had seen before—that there were few men in the country who were more practically conversant with educational questions, or who had more carefully and more judiciously investigated the relations of science to practical life. He begged to propose "the health of his Royal Highness Prince Albert, the Prince of Wales, and the rest of the Royal Family." (Drunk with loud cheering.)

The Chairman again rose, and spoke as follows:—Gentlemen—probably that intimation which you have just heard will announce to you that I am about to propose that which is emphatically described as the toast of the evening. In proposing it I shall have to request your indulgence, and in doing so I will make you two promises; the one is that I will trespass upon that indulgence during as short a time as possible; the other, that if I can help it I will not utter one word which does not bear directly upon the subject of the toast. Gentlemen, the toast which I have to propose is "Prosperity to the Society for the Encouragement of Arts, Manufactures, and Commerce." I need not recall to you what the purpose of that Society is, or what has been its history during the century of its existence. The narrative of its origin may be familiar to some of you, but as there are many here to whom it is unknown, I will, with your permission, advert in passing to one or two leading facts connected with that history. In the year 1721, some printed letters appeared containing proposals for the establishment in London of an association, to be called—"The Chamber of Arts," the object of which was the promotion of mechanical inventions and scientific discovery. That scheme came to nothing, and I mention it for a reason that will appear in a moment. Twenty-seven years later, in 1748, Franklin, the American, projected, and carried through, the plan of an American Philosophical Society. Now I mention these two attempts, one of them abortive, the other carried out in a distant country, because it is a curious fact, that amongst our earliest minutes, in the handwriting of the founder of this association, are to be found the prospectus and various details connected with those two associations, and that our original scheme of constitution differs very little from theirs. I think that from that fact two inferences may be drawn; one, that mere remoteness of distance (and we must recollect that a hundred years ago America was as distant as Australia is now), that mere remoteness of distance interferes in a very slight degree with the propagation of philosophical ideas; the other (and that is a result which the friends of science and the friends of education have both of them often-times need to lay to heart), that apparent failures are not always real failures, that plans which fail at the moment of being carried to a successful issue, may nevertheless sow the seeds of future enterprise, and under happier conditions come to maturity. It was in 1753—104 years ago—that our founder, Mr. Shipley, the brother of a bishop of that day, began his undertaking. He gathered a few friends around him; in the next year he published an address, stating what was to be the purport of the new society. Its object was to bestow rewards from time to time for productions, inventions, and improvements which should be (I do not quote the words) of a useful character, calculated to promote trade and to give employment to the population. You will see that at that time our only function was that of distributing rewards; but if we were limited in that respect, I may say that we were very much without a limit in reference to the objects for which those rewards should be bestowed. I look at the records of the Society in its first year, and I find that in that year the first three prizes that were given were—one for a manufacturing process, one for an improvement in agriculture, and the third was a prize for drawing. Now, what will strike you on hearing that statement is, that we at first embraced a very wide range of subjects, and that that range of subjects has been to some extent subsequently limited. But I think you will see that such subsequent limitation is no proof of failure or of short-coming upon our part, but was simply inevitable and necessary in the course of events. This is neither the time nor the place to enter upon a discussion of philosophical theories, but it is a recognised and universal law that progress in all human affairs involves, as a necessary condition, that which has been called "differentiation," the splitting up into several—often into many—branches that which was originally one. We see that law in the history of races; we see it in the history of languages; we see it in the history of science, which tends more and more to divide and subdivide itself, so that new sciences spring up in every age, detaching themselves from the old. We see it—to take a more familiar instance—in the progress of mechanical improvement. In the earliest stages of society, if an artificer made anything, he was expected to make everything, whilst now it takes 20 hands to finish a pin. Then I say that that division of thought in matters of science—that that division of mechanical labour in material concerns, is an inevitable law and tendency of progress, and that is the explanation of the history of this association. It was natural that art, for instance, should detach itself from us, and set up an academy of its own; and here I may mention, in passing, that the first public exhibition of pictures in this country (in 1760) was held in the room of the Society of Arts in the Strand; and I may further mention, that the very scheme on which the Royal Academy was established, is to be found upon our minutes. It was equally natural that at a later time the Agricultural Society should take exclusive possession of one department, that geography, architecture and engineering should each establish social centres of their own; that statistics should be appropriated by a still more recent association; that a Law Amendment Society should also trench upon one of our boundaries, discussing such questions as the law of patents; that the patent office reports should vie with us in bringing to light the records of past inventions and discovery, or, to take the latest instance of all—not because it is the most important—but because it is the last—that after a photographic exhibition had been held in our rooms, the photographers should have decided upon setting up for themselves, as they have done, I believe, with signal success. Now all these things, though of course they lessen our apparent strength and apparent influence on the public, are no proofs of failure—are no proofs of our having fallen short in the discharge of our functions; they are as natural, as legitimate, as certain to occur, as that the plant should shed its seed, and that that seed should spring up into a new and living organisation. But while we are dealing with the present, we are bound in justice to ourselves not to forget the past. Mechanical science, it may be, can now stand alone, but it is no less a fact recorded in our annals, that many important improvements in mechanical science have directly or indirectly originated with us. It may be that the sum of £100,000 or £150,000 which has been given away by us in prizes, constitutes an infinitesimally small reward as compared with those vast material results which the practical application of science has effected; but yet it is a fact, that these prizes have been eagerly and largely competed for, and we should do ourselves wrong if we were to ignore the fact that their money value is not, and cannot be, a test of the importance of the part which they have performed. Well, now, gentlemen, looking to those functions which we have to discharge, and which we are capable of discharging, in the present day, I see ample reason to believe that, not adhering pedantically to the letter of rules and customs, which may now be obsolete, but adhering to the spirit in which this Institution was founded, we may continue largely and powerfully to promote the origination and the diffusion of knowledge of a scientific and practical character. We may contribute to the origination of sound knowledge by our yearly published lists of desiderata in science, by the discussions which take place at our weekly meetings, and by the publication of those discussions and the comments upon them in our *Journal;* and when I refer to that journal, I may say, (and remember, gentlemen, I come from Lancashire), I have repeatedly seen it on the tables and in the hands of the leaders of our industrial manufacturing populations in those districts—in the hands of men who, more than all others, would be competent to expose unfounded pretensions in such matters, and who, we may be sure, would be very little inclined to receive suggestions of a merely speculative kind. We may promote the diffusion of knowledge by various means, but there are only two of them to which I think it necessary to advert at this moment. I think I need not tell those whom I meet in this room that the Mechanics' Institutions of this country, which were started at first with great enthusiasm on the part of their promoters, had, a few years afterwards—I will not say failed—I will not say fallen into disrepute—but had fallen short of the high expectations of those by whom they had been set on foot. I think I am within the mark when I say that of the 700 or 800 Institutions formed throughout the country, not one-half could, by a liberal construction of the word, be said to be in a flourishing condition. We could not supply all their deficiencies; we could not say we had probed to the bottom the causes of such failures, but there was one deficiency which, at all events, we could attempt to obviate, that was the want of union and co-operation amongst them. By correspondence, by the mutual interchange among all of the experience of each, by providing them with the means of obtaining publications more easily, and by originating a more systematic character of instruction, we thought we could bring about, to a considerable extent, the objects which they and we had in view. That attempt to unite the educational Institutions scattered through the country, was commenced about five years ago. Up to this time it has equalled—I may say it has surpassed, the most sanguine expectations that could reasonably be formed. About 360 of these Institutions are now in union with us, and I believe that constitutes a very large majority of those which at the present time may be said to be in good condition; but when that had been accomplished, when that reform had been effected, it occurred to some amongst us that something more was wanted, that it was desirable to methodise the instruction given at these Institutions, to concentrate it upon a few subjects, and to give it (I will not say a practical) but some direction and immediate purpose. That we proposed to effect, and are trying to effect, by means of our examinations. It was intended that certificates of having passed the Society's examinations should operate in the lower classes of society, in the same manner as academical degrees operate in the higher classes; and to increase the value of such certificate, above 500 of the principal employers of labour in this kingdom voluntarily signed a paper stating that they, in their capacity as employers, would attach great weight to certificates so given. Gentlemen, that system has been in operation too short a time as yet to allow me to speak with any certainty of its results. This, however, I may say—whereas on the first institution of the examinations last year, we had only 50 candidates who presented themselves for examination we have in the present year 230—nearly five times that number. If I may venture to take credit for that for which I think we are entitled to take credit, I do not think that we shall be presumptuous if we claim to ourselves the merit of having set a much larger—a much older—and, even here, I may say—a more important body in motion in the same direction. I hope—and so far as matters have gone yet, I see some reason to believe—that this system will work; and if that should be our fate, which has very often been our fate before—and if, when its success is certain, other parties capable of carrying it out upon a larger scale, should come forward to take it out of our hands, we shall not complain. We shall feel no disappointment. We shall say this is only a phase, and no new phase, of our career as an institution; that we have led the way, and others have been content to follow. Before I sit down, I will just mention that our material prosperity has increased. Our debts, which were never large, are being paid off; and the number of our members is above 2,000. I think, from what I have stated, you will agree with me, that if our Association is old, it is none the less vigorous. I think you will agree with me, that in its working it has shown no pedantic adherence to old rules and old customs; that we have always endeavoured to do, in our day, that which its founders would have done if they lived now; and that we have never lost sight of the necessity of adapting ourselves to the changing requirements and changing opinions of the times. You have heard, gentlemen, already, that we are honoured by the patronage of those who stand highest in this country; but there is another kind of patronage, of which we have a right to be more proud, and that is the support—the constant and continued support—of those classes who are the best judges of our value and of our success—of those classes for whose benefit, in the main, these Societies are carried on. Gentlemen, I ask you to join with me in drinking, with three times three, and hearty good-will, the toast which I shall now propose. I give you—"Prosperity to the Society for the Encouragement of Arts, Manufactures, and Commerce."—(The toast was drunk with loud cheering.)

Colonel Sykes, F.R.S., Chairman of the Council, said—The noble lord had left him nothing to say—he had exhausted the subject, he had developed the principles, and left him (Colonel Sykes) only the details. A great deal was written and talked just now about education; conferences were held about the education of children, but it was absurd to talk of the education of children of 10 years of age; reading and writing were not education; children left school and forgot the little they gleaned. It was absurd to suppose that children could be induced, by mere advice, to take that course which they did not see to bear on their material interests. Now, the Society of Arts had stepped in to weld this broken chain of intellectuality, by strengthening the action of the Mechanics' Institutions, by holding out inducements through the examinations appointed by the Society. It would secure the success of the Society's movements were the government to place at the disposal of the Council of the Society of Arts, nominations to compete for employments in the public offices, but he feared government would not do this without a little wholesome agitation. Colonel Sykes concluded his remarks by proposing "Success to the Institutions in Union," with which he begged to associate the name of Mr. Arthur Ryland.

Mr. Arthur Ryland, President of the Birmingham and Midland Institute, returned thanks and proposed as the next toast, "The Health of the Examiners," which was acknowledged by the Rev. Professor Browne, who stated that the examinations this year had been a complete success.

Sir Joseph Paxton gave the toast of "The Fine Arts," coupled with it the name of Professor Donaldson, who returned thanks.

Mr. James Caird, M.P., proposed the health of the noble Chairman, which was drunk with much applause, and Lord Stanley returned thanks.

SIXTH ANNUAL CONFERENCE.

The Sixth Annual Conference between Representatives from the Institutions in Union and the Council of the Society, was held on Wednesday, the 24th inst., at the Society's House, in the Adelphi. Colonel Sykes, M.P., F.R.S., Chairman of Council, presided.

The following is a List of the Institutions represented at the Conference, with the names of the respective representatives:—

Barnet, Institute	Mr. Stephen Baldock
Basingstoke Mechanics' Institute	Mr. Wyndham S. Portal
Belfast Working Classes Association	Mr. H. M'Calmont Cairns, M.P., and Mr. R. Davison, M.P.
Bexley Heath	Mr. Flaxman Spurrell
Birmingham and Midland Institute	Mr. Arthur Ryland
Birmingham, Messrs. Chance's Glasswork's Library and Reading Room	Mr. F. Talbot
Boston Athenæum	Mr. Jas. W. Bontoft
Braintree and Bocking, Literary and Mechanics' Institution	Mr. Geo. Courtauld
Bristol Athenæum	Rev. Canon Girdlestone and Mr. Edward Halsall
Bromley (Kent) Literary Institute	Mr. J. Nettlefold
Cambridge Mechanics' Institute	Mr. H. Hemington Harris
Carlisle Mechanics' Institute	Mr. Joseph Ferguson
Chatham Mechanics' Institution	Mr. Joseph Pyke
Chichester Literary Society and Mechanics' Institute	Mr. H. W. Freeland
Croydon Literary and Scientific Institution	Mr. S. L. Rymer
Devizes Literary and Scientific Institution	Rev. P. A. L. Wood
Dumfries and Maxwelltown Institute	Mr. John Jones
Ely, Mechanics' Institution	Mr. Trigg
Fenton Athenæum	Dr. S. B. Goddard
Hanley, Pottery Mechanics' Institution	Mr. J. L. Ricardo, M.P.
Hastings, Mechanics' Institution	Mr. John Banks
Hertford, Literary and Scientific Institution	Mr. John Marchant, jun.
Highgate, Literary and Scientific Institution	Mr. James Yates and Mr. Wm. P. Bodkin
Hitchin, Mechanics' Institution	Mr. Joseph Pollard
Huddersfield, Mechanics' Institution	Mr. Frank Curzon
Leeds, Mechanics' Institution	Mr. James Kitson, C.E., and Mr. Alex. McIvor
,, Yorkshire Union of Mechanics' Institutions	Mr. Thos. Wilson, Mr. Jas. Holl, and Mr. Barnett Blake
Lewes, Mechanics' Institution	Mr. W. Button, Mr. R. Crosskey, and Mr. H. Brown
Lincoln, Mechanics' Institution	Mr. Jas. Snow, and Mr. Jas. Hitchins
Lockwood, Mechanics' Institution	Mr. J. C. Fenton
London, Battersea Mutual Improvement Society	Mr. A. J. Austen
,, Belmont Mutual Improvement Society	Mr. W. Winsford
,, Crosby Hall Evening Classes	Rev. Rd. Whittington and Rev. Thos. Hugo
,, Domestic Mission	Mr. J. M. Wade

London, Great Western Railway Literary Society	Mr. H. Rennie
,, Hackney Literary and Scientific Institution	Mr. Henry Althans
,, Marylebone Literary and Scientific Institution	Mr. Jacob Bell
,, Mechanics' Institution	Mr. Sam. Vallentine
,, Newington Tailors' Labour Agency Literary Institute	Mr. J. A. Dunn
,, Royal Polytechnic Institution Classes	Mr. J. C. Buckmaster
,, and South-Western Literary and Scientific Institution	Mr. Fred. J. Macaulay
,, Walworth Literary and Scientific Institution	Mr. J. S. Noldwritt
Longton Athenæum and Mechanics' Institution	Dr. S. B. Goddard
Maidenhead, Mechanics' Literary and Scientific Institution	Mr. Wm. Stephens
Margate, Literary and Scientific Institution	Mr. T. J. Pearsall
Morpeth, Mechanical and Scientific Institution	Mr. Matthew Soulsby
Newport Athenæum	Sir Thos. Phillips, Bart.
Northallerton Institute	Mr. W. B. Wrightson, M.P.
Oldham, Lyceum	Mr. Jas. Platt, M.P.
Painswick, Mechanics' Institute	Mr. W. H. Hyett
Pendleton, Mechanics' Institution	Mr. Jos. Ashworth
Peterborough, Mechanics' Institution	Mr. Jno. Whitwell
Portsmouth and Portsea, Literary and Philosophical Society	Mr. B. W. Carter
Redhill Institution	Mr. George Holden
Reigate, Mechanics' Institution	Mr. T. Martin
Richmond, Parochial Library and Reading Room	Mr. Holmes
Sevenoaks, Literary and Scientific Institution	Mr. George Franks
Sidmouth Institution	Mr. W. T. Radford
Southampton Polytechnic Institution	Rev. E. Kell
Tunbridge Wells Useful Knowledge Institution	Mr. N. E. Stevens
Wakefield, Mechanics' Institution	Rev. W. R. Bowditch
Ware Institute	Rev. J. W. Blakesley
Waterford, Mechanics' Scientific Institute	Mr. John A. Blake, M.P. (Mayor of Waterford)
Wenlock, Agricultural Reading Society	Mr. R. D. Grainger
Windsor and Eton, Literary, Scientific, and Mechanics' Institution	Mr. Thos. Chamberlain
York, Institute of Popular Science and Literature	Mr. Alderman Leeman

The Secretary read the following

REPORT.

To the Council of the Society for the Encouragement of Arts, Manufactures, and Commerce.

Gentlemen,—The Union of Institutions having now completed five years of its existence, it would seem a fitting time, at this the Sixth Conference, to look back to the leading objects had in view at the time of its commencement, and see how far they have been attained, which of them have been found to be impracticable, and what remains to be done. During this period the free discussions which have taken place at the Annual Conferences, as well as the deliberations of the Council on the business of the Institutions, have led to a more just appreciation on both sides of what is required on the one hand by the Institutions, and on the other of what is really practicable for their benefit. The great principle with which the Union started has ever been borne in mind, that the Council of the Society of Arts, whilst assisting the efforts of the Institutions to improve themselves, should leave untouched their freedom of action, should stimulate their endeavours, and promote their success. It will be remembered that on the establishment of the connexion between the Institutions and the Society, fears were not unnaturally felt by some lest the Society, for some covert desires of its own, should compromise the freedom of the Institutions, and fetter their action. An unrestricted intercourse during five years has shown how unreal were these suspicions. The objects with which the Union commenced may be noted in a few words :—

1. That by union the experience and information of each separate Institution might be rendered useful to the general body of Societies, and the views and wishes of each should have some recognised centre of expression, and an organization for promoting their welfare.

2. A more general intercommunication one with another.

3. That facilities be afforded for making the Institutions more readily effect engagements with competent lecturers.

4. That books, maps, philosophical instruments, &c., be procured at reduced rates.

5. That facilities be afforded, by interchange and otherwise, for the formation of Local Museums, Exhibitions, &c.,

6. That endeavours be made to procure an amendment of the laws which affect the Institutions, the distribution of parliamentary papers, &c.

7. That the Institutions be assisted to become places of systematic instruction, with systematic examination and certificates of the result of studies.

The *Journal* of the Society was established as one means of carrying out the first object, whilst the conferences and constant correspondence with the Institutions assist materially in promoting it. I cannot help, however, remarking with regret,—and the same thing has been expressed on former occasions—that the Institutions do not avail themselves of the pages of the *Journal* to that extent which they might with mutual benefit and interest to each other. I must again urge on those in whose hands the management of these bodies is vested, to place on record in the pages of the *Journal*, the valuable experience which they cannot fail to have gained whether in their failures or successes. What would be more interesting and valuable to the general body, than the detailed workings of a successfully conducted Institution ; how it would stimulate others in the same direction, as well as teach them the means of obtaining their desires. My communications with the Institutions enable me to speak with confidence that there are many among them anxious to improve and increase their usefulness, but their managers, however earnest and energetic, neither know what can be done nor how to do it.

To show what may be done, how difficulties may be got over, and how practically a good system may be established and efficiently worked, must induce others to emulate the example, improve existing means of instruction, and establish new ones. I will occupy your time no longer in pointing out how important, as an element in the improvement of the Union, such communications to the *Journal* would be, and how powerful an instrument for good among the Institutions the *Journal* might thus become. It rests, however, with the Institutions themselves to develop this feature. The Council can do more than place the pages of the *Journal* at their disposal, and urge upon them the value of such communications, being at all times ready so far as lies in their power, to give expression to the wants and wishes of the Institutions, and bring the influence of the Society to bear in promoting their welfare.

The attainment of the second object is, to a great extent, involved in the means adopted for accomplishing the first, and it is greatly promoted by that which a large number of the Institutions have, at the suggestion of the Society, adopted—the interchange of privileges, so that the member of one Institution, being temporarily in the neighbourhood of any other, may enjoy at that other, during his stay, the privilege of admission to its lectures, library, reading-room and exhibitions. This privilege, small as it may seem, tends materially to bring about friendly relations between the Institutions, destroys the isolation which still to some extent exists, and brings about an amount of co-operation with each other, which cannot fail to be beneficial.

Upon the subject of lectures and lecturers, it will be remembered how much discussion has taken place, and how much it was thought, in the early days of the Union, could be accomplished in this direction for the benefit of the Institutions, how much anxious deliberation was expended in endeavouring to solve the problem of enabling the Institutions to obtain good lectures and good lecturers at a cost commensurate with their value and the means of the Institutions. Plan after plan, scheme after scheme, was anxiously discussed, till both sides became convinced that they were seeking that which to a very great extent, under existing circumstances, was impracticable. Till there is more co-operation and united action among the Institutions of a district, and a greater desire for systematic teaching by lectures, little can be done in this direction. However, notwithstanding this, it was seen that some assistance might be afforded to the Institutions, in reference to the lectures, by the Society placing at their disposal information on this head, which would facilitate these lecture arrangements. Accordingly a list of lecturers recommended by the Institutions themselves, was in the first instance compiled from returns made by the Union, and was published and issued to the Institutions. Experience soon showed that this might be improved, and a greatly enlarged lecturer's Directory, published in June, 1856, was the result. The correspondence during the year, and the constant demand, show the value set upon it by the Institutions.

The sixth object has been fully and satisfactorily accomplished in all respects, and the privilege of purchasing books at the reduced rate is largely taken advantage of by the Institutions. I am unable, for the reasons given in my last report, to state the amount in value of the books purchased, but as all the orders pass through my office, I have no hesitation in stating my belief that a very considerably increased number of books has been purchased this year by the Institutions, as compared with any former year. Several Institutions also have availed themselves of the privilege accorded last year by the Privy Council to classes in Institutions of purchasing books from the list at the same reduced rates as schools under inspection, viz., at a discount of about 40 per cent on the published prices.

In reference to the formation of Local Museums, the Society has endeavoured to promote that object, by calling attention to its importance, and showing how readily, by the interchange of specimens between various localities, such establishments may be improved, and their sphere of usefulness increased. Although the Society has, in several instances, become the medium by which such interchanges have been effected, yet far too little attention has been given to the subject by the Institutions. Special attention should be directed to this point. If a dozen, or even half-a-dozen, Institutions would each prepare a dozen, or half-a-dozen, sets of the natural and other objects for which their locality is specially remarkable,—and this could, in most instances, be readily accomplished,—and interchanges were effected with each other, each Institution would thus become, at a comparatively small cost, possessed of a valuable collection, which might be made available, as a powerful educational instrument, for illustrating the studies of the classes and lectures. Such collections would stand out in bold and life-like relief contrasted with the dusty cases of dried fish-skins, "alligators stuffed," and outlandish articles which so commonly constitute the useless stock-in-trade of ordinary museums. It is needless to dwell on the efforts the Society has made at all times to assist in the establishment of local exhibitions,—they have been detailed in previous reports,—but I may be permitted to add, that the Society's travelling collection of photographs is still in as great demand as when first formed.

The Literary and Scientific Institutions Act, passed a few years since, at the instance of the Society of Arts, is one of the fruits of the Union, and has placed Institutions in an improved legal position. It is useless now to take up your time with repeating its provisions. Since then, at the urgently-expressed wishes of the Institutions, the Council have had prepared a Bill for amending the law relating to the exemption of Institutions from local rates. The Bill was brought into Parliament last year, under the charge of Mr. Hutt, Lord Stanley, and Mr. Ewart, and had met with the general approval of the House of Commons, when the early adjournment of the Parliament rendered its passing impossible that session. The Bill has again been brought into the House of Commons this year, under the charge of the same gentlemen. It has been altered in several points, to meet the views expressed last year in the House of Commons. It has been read a second time, and the discussion takes place upon it in Committee on the 24th inst. The Society has placed in the hands of Mr. Hutt, for presentation to the House of Commons, a petition, under the seal of the corporation, praying that the Bill may be passed into a law. Many Institutions have petitioned in its favour, but it remains to be seen how the new Parliament will deal with it.

The distribution of the Parliamentary Papers was made the subject of a Committee of the House of Commons at a very early period of the Union. The Committee reported generally in favour of the principle, but owing to the death of the Chairman the attention of the House was never called to the practical means of carrying out that principle. There are considerable difficulties in the way, but there is no reason for the Council to despair of seeing this matter placed on a useful footing. To obtain the indiscriminate distribution of all the reports (a ton weight, it is said, annually) would be no boon to an Institution, but if reports of special interest on special subjects, could be distributed either to such Institutions as specially desired them, or to such Institutions as locality or other special circumstances might point out as fitting recipients, it is considered that thus much valuable information would be made available to the members of the Institutions, at little or no cost beyond what is incurred for producing what is, oftener than not, under the existing system, mere waste paper.

The main object, however, of the Union, in addition to the other means of improvement, was the assisting the Institutions to become places of systematic instruction, and for this purpose that systematic examinations, to be followed by certificates, should be established. This system was inaugurated last year, and the first examination was attended by 52 candidates. The result was most encouraging. The amount of knowledge displayed on the part of the candidates was highly satisfactory. The details were given in last year's report. The Conference will be glad to hear that three of the most successful candidates at the Examination have, in consequence, obtained appointments. One, Charles Chambers, of Leeds, as assistant-observer at Kew Observatory; and two others, Robert Abbott and William Matthew Taylor, as clerks in the Privy Council Office.

The first experiment in the way of examinations having been successful, one of the first duties of the Council was to organise a plan for extending them, and for placing them on permanent basis. With this view a series of new byelaws were prepared by the Council, and passed at a special General Meeting of the Society, making the examination system an integral part of the Society's action, and forming a Board of Examiners, with regulations for their duties and succession. The Council felt that to confine the examinations to London, was to deprive a very large number of the Institutions of all benefit from the system, whilst to extend it to numerous centres, so as to bring the examinations within the reach of all, was an undertaking so great, and requiring so large an amount of funds for establishing a fitting machinery for the purpose, as to render it necessary for the Society to pause before it committed itself to it. Communications were received from several places, desirous of having examinations held in their special localities, and it was with great regret that the Council felt compelled, as a matter of prudence, to decline the requests made. It was felt that in the first instance it would be better to proceed step by step, gaining experience as the Council proceeded, and the Council therefore determined for the second year to have one centre only for examination in addition to that in London. After much consideration Huddersfield was chosen, as lying in the neighbourhood of a large number of working Institutions, and the head-quarters for this year of the Yorkshire Union of Mechanics' Institutions. The result has been a success. While last year there were but 52 candidates in all, there were 80 this year in London, and 140 at Huddersfield. The examination was conducted at both places simultaneously, the same papers being put before the candidates at each place. So far as the London examinations are concerned the results are known, but the Examiners have not yet had time to complete their awards for Huddersfield. The Examiners report generally a very marked improvement in the character of the knowledge displayed by the candidates there, as contrasted with the last. This must be taken as in no way depreciating the merits of those examined last year, who exhibited a degree of excellence which the Examiners at that time were quite unprepared to expect. Several who obtained certificates of a lower grade last year have well employed their time in the interval, and are rewarded by certificates of a higher grade this year. This is as it should be. The prizes to those examined in London were distributed yesterday, under the presidency of Sir John Pakington, M.P. In the appendix annexed to this report will be found the results of the London Examination. The Huddersfield distribution of prizes is fixed for the 29th of July, when Lord Granville has kindly consented to preside.

On going through the Reports which have been sent me from the various Institutions as requested in my circular, it is gratifying to find that there is a greater activity displayed through these bodies than it has been my lot to notice at any previous period. I have received a much larger number of them than hitherto, and this of itself is an evidence that more is stirring in the Union. I find on examining them, more attention is being paid to classes, and systematic instruction, and less complaint of straightened funds; however, I still fear that limited means are in many instances one cause of diminished usefulness. There is, however, a growing faith in the Institutions, and if they endeavour to provide that which is practically useful —that which the people really want—no difficulty will be found as to funds. If the Institutions are not yet all that earnest and far-seeing men have desired, and hoped they might become,—the accredited centres of popular instruction,—we must not be disappointed or despair so long as each year has shown us they are reviving and their usefulness increasing.

I am, Gentlemen,
Your obedient servant,
P. LE NEVE FOSTER,
Secretary.

APPENDIX.

EXAMINERS' REPORTS.

The Mathematical Examiners appointed by the Council of the Society of Arts to conduct the examinations at the Society's house in the Adelphi, beg to report as follows:—

"The examinations in mathematics were held during the first week of June, and extended over twenty-four hours, in periods of three hours each. The sub-divisions were Arithmetic, Book-keeping, Algebra, Geometry, Mensuration, Trigonometry, Conic Sections, and Nautical Astronomy. The number of Candidates in each sub-division, and the certificates awarded in each, as also the number of prizes, is given in the subjoined tabular statement.

"The Examiners note a marked improvement, not only in the extent of the information possessed by the candidates in nearly all the sub-divisions of the science, but in the precision and accuracy displayed in their written answers and oral examination. In some of the papers set, the Trigonometry paper for example, the Examiners were struck with the facility and fertility of resource with which several of the Candidates treated the algebraical formulæ which occur in the course of the solutions of many of the questions. In Arithmetic the answering was general and precise, in Mensuration not quite so satisfactory, and in Geometry much less so. In Conic Sections the answering was very good, but the subject was treated chiefly by algebraical methods.

"At the close of this, their very satisfactory and encouraging report, the Examiners believe it to be their duty to call public attention to the excessive cultivation of the habit of manipulating algebraical formulæ, to the comparative neglect of the severer, but far more useful study of geometrical deduction. This exclusive cultivation of algebraical modes of proof was instanced in the case of almost every candidate who presented himself for examination. While a familiar acquaintance was shown with the management of algebraical formulæ, and the processes of analytical transformations, but little attention seems to have been given to the methods of pure geometrical conception: yet no one will deny the far higher importance of the latter as compared with the former, whether considered as a mental exercise, or with reference to the future employments of the Candidates. It is surely of more importance to such persons to have clear mental conceptions of the properties of plane figures, and of their mutual intersections in space, as also of solids and curved surfaces, whether with reference to the arts of construction or facility in following specifications of works or descriptions of machinery, than to manipulate with symbols in conformity with mere mechanical rules and prescribed operations, of which few can give an intelligible interpretation.

"The Examiners in Mathematics believe that middle-class education in this country, so far as it deals with Mathematics as a subject of mental exercise, requires considerable revision, and a return to a wiser practice.

The Examiners in Bookkeeping report, "the general aspect of the Examination presents an improvement on that of last year, and are inclined to think that the questions might be shortened with advantage, that is, having regard to the time allowed to the candidates for answering them."

Professor Solly, one of the Examiners in Chemistry, reports as follows:—

"I return you herewith the chemical examination papers, together with my report on the relative value of the answers given by the respective candidates. As the Council desire that the Examiners should express their opinion on the general merit of the replies, I have much pleasure in stating that the answers given in the chemical examination were highly creditable to the candidates, and evinced, at the same time, very considerable theoretical knowledge and practical acquaintance with the application of chemistry to the arts."

Mr. J. C. Morton, one of the Examiners in Agriculture, reports:—

"As there were only two who presented themselves for examination in Agriculture, I have had but little difficulty in making my award.

"One of these gentlemen furnished a set of replies indicating much general as well as agricultural intelligence, and he fairly earned his certificate of 'excellence.' The other set of replies was much less perfect, and the award in this case must be made in accordance simply with the inferior numerical valuation which I have made of the paper.

"The only result to which my experience this year will lead me is to prepare, for future occasions, a less numerous series of questions, as I find that the three hours allotted are not sufficient time in which to answer the list I have hitherto drawn up."

Dr. Humphreys, the Examiner in Political Economy, reports thus:—

"Of the five candidates whose papers I have examined, three display very considerable knowledge of the subject, namely, Nos. 78, 116, and 110. The second of these has won the highest number of marks, but I am induced to think that the first possesses a sounder knowledge of the science, as well as greater grasp of mind. The papers of both, however, are deserving of much commendation, as are also some of the answers given by 110. In the papers of candidate No. 152, some very serious errors in orthography occur, and although some of his answers evince ability and study of his subject, there are evidences of a want of method in his reading, as well as of too great a readiness to jump hastily at conclusions on insufficient premises. Candidate No. 68 does not seem to have fully comprehended the bearing of several of the most important questions. One of the answers of candidate No. 116 evinces an inclination to place too little value on first principles, or, perhaps, I should rather say, to take things for granted which the true student of Political Economy is well aware require accurate demonstration, and I would recommend him, and indeed all the candidates, to devote patient study to what are generally considered the elementary parts of the science."

The Examiners in Geography report thus:—

"On the whole, both the paper work and the *viva voce* examination of the Candidates appear to us to be by far more satisfactory than those of last year. As might have been reasonably expected, the fruits of a closer and more methodical study of the subject were very apparent.

"In the few cases of partial failure while interrogating the Candidates, we came to the conclusion that their mistakes in *every* case had been an attempt to read books on the more advanced topics of the science, when they were not well grounded in its first elements. We found that, instead of studying some simple introduction to Descriptive Geography, they had been trying to master such books as Cosmos, or Buff's Physics of the Earth.

"We must express our conviction that, in the next examination, either the questions should be grouped in sections, one question only in each section to be answered, or else a limited proportion of the questions should be prescribed for the Candidate's selection. For example, in a paper of twenty questions, the Candidate might be warned that marks would not be given for more than twelve answers. We conceive that, by one of these methods, we should considerably improve our results. In the very first papers which we examined, it was evident that the matter had suffered in some degree, owing to the desire of the Candidate to deal with the whole twenty questions; in the inferior papers the evil was very strongly marked."

"The Examiners in English History and English Literature have to report to the Council of the Society of Arts that they have awarded to Candidates 61, 62, 87, 113, 75, 147, 164, certificates of the first-class, and to Candidates 110, 153, 166, 107, certificates of the second-class. They beg also further to state, that all the Candidates have acquitted themselves to the satisfaction of the Examiners, and that the written and oral examinations of those Candidates to whom first class certificates have been awarded, were deserving of the highest commendation for accuracy, extent of information, and thoughtfulness.

"The Examiners have also the gratification of stating that the Candidates for this year have shown a marked and decided improvement on those of the last, and thus have justified the proceedings of the Society in reference to this portion of its labours, and satisfactorily proved the value and importance of these examinations."

Mr. F. R. Sandford, one of the Examiners in Roman History and in Latin, reports as follows:—

"In reply to your inquiry as to the character of the recent examinations in Latin and Roman History, I have to state that, in every respect save one, it was extremely satisfactory.

"The Board of Examiners will observe, that all the candidates are recommended for certificates except two, and that some of the certificates are lower than the second class. As the works selected for the late Examination were of a somewhat higher character than those of last year, a comparison of the class lists of the two Examinations, will, of itself, indicate that a very marked advance has been realised in the interval between them.

"This improvement was apparent in nearly every particular, but more especially in the accuracy of the construing, and in the power of grammatical analysis, of which the candidates gave proof in the *vivâ voce* part of their examination.

"Fulness of classical knowledge was not to be looked for in the youths who came before us; but accuracy in what is professed to be known at all, may always be attained, and, in this respect, the performance of the candidates was very creditable.

"I should have been glad to have seen proof of more attention having been given to some *good* history of Rome, such as that by the Dean of Christchurch, which, in a cheap form, is now within the reach of everyone. The answers to the questions on Roman History pointed to too great familiarity with mere epitomes. We had the outlines accurately given; but the memory had been exercised more than the mind, and the results of such study, when put on paper, were somewhat meagre.

"I hope that another year will furnish us with a *larger* and *older* class of candidates than those who recently came before us. In this respect alone was there anything to complain of at our late meeting."

Dr. Bernays, the Examiner in German, reports as follows:—

"I am happy to be able to report most favourably of four out of the seven candidates who presented themselves before me for examination. I do not hesitate to say, that they exhibited more real knowledge of the German language than I found in any I ever had to examine. They understood thoroughly the passages I gave them to construe, from the authors they had prepared themselves in; they displayed a considerable familiarity with the grammar, translated from English into German with few mistakes, and spoke the language with fluency, although not faultlessly. Their pronunciation was quite intelligible, although, with three of them, too provincial. Still I may fearlessly say, that, if they continue their studies for a couple of years more, and go on reading the classical works of the country, they will be better German scholars than the great majority of men of their own class in Germany itself. Of German literature, they knew little beyond the few books they had read themselves, (which is, after all, the only valuable knowledge); and of German History just what they had picked up from English books. Yet, more could hardly be expected from men so young, and engaged in such arduous employments as they told me they were, and which left them only a few evenings, after fatiguing days, for study."

Mr. Cary, one of the Examiners in Free-hand Drawing, reports thus:—

"Of the four candidates in free-hand drawing, whose specimens I examined, only one (No. 149) is worthy of a certificate. His work was so good, and the replies which he gave to the questions put by Mr. Bell were so very satisfactory, that he ought to have a first-class certificate. This candidate gained a second-class last year, and had not the examiners in drawing objected to it, the board would have awarded him a first-class at that time, when he would have had the prize of £10 10s. offered by Mr. Graham. I must, therefore, now urgently represent to the Council how deserving he is of a prize of equal value."

Mr. B. Waterhouse Hawkins, the Examiner in Practical Drawing, reports as follows:—

"Of the six candidates who presented themselves for examination in practical drawing at the Society's House in London, on the 5th of June, 1857, I beg to recommend those bearing the following numbers as deserving the notice of the Council, they having proved themselves to be well acquainted with the rules of perspective and their practical application to the representation of the simple geometrical solids according to dictation, which was the form of oral examination I adopted on that occasion.

"Candidate No. 149 could give but one hour to the mechanical drawing, which he employed most satisfactorily by drawing each object as dictated; I beg, therefore, to join the recommendation of my coadjutors, Messrs. Cary and J. Bell, that this candidate, No. 149, have the first prize for drawing bestowed upon him, and that it be not less in money than the amount of the first prize offered for drawing last year, for which this same candidate then competed with so much promise, and has this year entirely realised it, fully justifying the sound judgment expressed by Mr. Cary after last year's examination.

"The circumstances, as described by the candidate No. 149, under which he has advanced during the past year to his present attainment, are, I think, worthy of being brought before the notice of the Chairman of the Board of Examiners.

"The candidate 149 is apprenticed to a carpenter, and has continued constantly to work at his trade, having devoted all his leisure, part of his meals' time, and allowed holidays, to the study of drawing. There is not any drawing school or teacher of drawing within an available distance of his residence. He has acquired the theory of perspective from books, testing and applying its rules to natural objects. Assuming these circumstances to be truly described, I beg to suggest that an addition of some useful books be made to the prize of money, that the sum of ten pounds, named last year for the first prize for drawing, may be given entire, as the circumstances of the candidate may be supposed to make the cost of his journeys from Lincolnshire to London a serious object to him.

"Candidate No. 161 answered all questions very satisfactorily, worked out the subjects dictated with facility and certainty; he had acquired the practical application of the principles of perspective to mechanical drawing by the voluntary use of his leisure hours, he being engaged as a clerk in a business that occupies all his working time.

"Candidate No. 77 could only give two hours to the geometrical drawing, having been engaged in other examinations during the day. I found his drawings to be well executed, the forms and perspective according to the position dictated being well understood."

PRIZES.*

The following are the names of the candidates to whom prizes were awarded at the recent Examinations in London:—

For General Excellence in the Examinations.

Thomas Brodribb..........	Crosby Hall Evening Classes.
Edward George Clarke...	,, ,, ,,
Henry Cullum	,, ,, ,,
William Dawson	Boston Athenæum.
William Evan Edwards..	London Domestic Mission.
Thomas Howard Evans...	Crosby Hall Evening Classes.
John William Fletcher ..	Devonport Mechanics' Institute.
Nathaniel Frankenstein..	Clarendon House School, Lambeth.
John Fretwell.........	Crosby Hall Evening Classes.
Harry George...............	Bury St. Edmund's Commercial School.
Daniel Leggatt	London Mechanics' Institution.
Frank Marshall	Crosby Hall Evening Classes.
Joseph Mayhew............	Bury St. Edmund's Commercial School.
Robert John Pearce......	,, ,, ,,
Edward Philip Plowman	,, ,, ,,
Joseph Benjamin Rundell	Pimlico Literary Institution.
Henry Gordon Shea	Clarendon House School, Lambeth.
Charles Aspull Wells.....	Lewes Mechanics' Institution.

In Agriculture.

Joseph Pollard.............	Hitchin Mechanics' Institution.

In Freehand Drawing.

Robert Slingsby, junr. ...	Lincoln Mechanics' Institution.

CERTIFICATES.

The following is a list of the candidates who obtained certificates:—

In this List, the letters placed after the names have the following signification:—

(E) denotes a Certificate of Excellence.
(P) ,, ,, Proficiency.
(C) ,, ,, Competency.

Arithmetic, 43 Candidates.

Royal Polytechnic Institution, Regent-street:—James Henry Bacon (C), James Bongard (C), F. Brazileir (C), C. Dibbs (C), J. Ebbs (P), W. H. Favenc (P), J. Lang (P), P. Macpherson (C), J. Morgan (C), C. J. Page, H. C. Smart (C), J. Soper (C), J. Swinton (C), H. Warner (C).

Boston Athenæum:—W. Dawson (P).

Crosby-hall, Evening Classes:—F. Marshall (P), F. W. Potter (P).

London Mechanics' Institution:—D. Leggatt (E).

Great Western Railway Literary Society:—R. Perry (E).

Clarendon House School, Lambeth:—C. H. Capper (P), N. Frankenstein (P).

Guernsey Mutual Improvement Society:—S.T. Tandevin (C).

Messrs. Chance's Reading Room and Library, Birmingham:—J. Duncan (P).

Devonport Mechanics' Institution:—J. W. Fletcher (P).

Commercial School, Bury St. Edmunds:—F. Ford (P), H. George (E), J. Mayhew (E), R. J. Pearce (P), E. P. Plowman (E), H. Robinson (P).

Society for the Diffusion of Useful Knowledge, Greenwich:—C. S. Cartwright (C).

Oxford House School, Chelsea:—A. W. Davis (P), G. Godward (P).

Bayswater Grammar School:—H. Houghton (C), R. Ottley (C).

London Domestic Mission Reading Room:—J. Edwards (C), W. E. Edwards (C).

Pimlico Literary Institution:—J. B. Rundell (C).

Sheerness Mechanics' Institution:—W. Rickard (P).

Belmont Mutual Improvement Society:—Wm. Miles Medcraft (C).

Book-keeping, 28 Candidates.

Royal Polytechnic Institution:—J. H. Bacon (C), C. Dibbs (C), F. W. Everett (E), W. Seward (P).

Clarendon House School, Lambeth:—C. H. Capper (C), N. Frankenstein (C).

Messrs. Chance's Reading Room, Birmingham:—J. Duncan (P).

Commercial School, Bury St. Edmunds:—F. Ford (P),

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* Each prize consisted of a set of books of the value of £4, selected by the candidate from a list furnished by the Council. In the case of Robert Slingsby, jun., and Joseph Pollard, the prizes of ten guineas each, offered, but not awarded for their special subjects last year, were given in addition.

Crosby Hall Evening Classes :—F. Marshall (E).
Great Western Railway Literary Society :—R. Perry (C).
London Mechanics' Institution :—Daniel Leggatt (E).

Algebra, 30 Candidates.

Royal Polytechnic Institution :—J. H. Bacon (C), W. H. Favenc (E).
Oxford House School, Chelsea :—A. W. Davis (C), G. Godward (C).
Boston Athenæum :—W. Dawson (E).
Messrs. Chance's Library, Birmingham :—J. Duncan (C).
Devonport Mechanics' Institution :—J. W. Fletcher (E).
Bury St. Edmunds Commercial School :—F. Ford (P), H. George (P), R. J. Pearce (E), E. P. Plowman (E).
Lambeth Clarendon House School :—N. Frankenstein (C).
Crosby Hall Evening Classes :—F. Marshall (P).
Great Western Railway Literary Society :—R. Perry (P).
Pimlico Literary Institution :—J. B. Rundell (E).
———————— :—R. F. Hosken (P).

Geometry, 28 Candidates.

Boston Athenæum :—W. Dawson (E).
Oxford House School, Chelsea :—A. W. Davis (C), G. Godward (C).
Messrs. Chance's Reading Room, Birmingham :—J. Duncan (P).
Royal Polytechnic Institution :—W. H. Favenc (C), J. Lang (P), J. Swinton (P).
Devonport Mechanics' Institution :—J. W. Fletcher (P).
Bury St. Edmunds Commercial School :—F. Ford (C), H. George (P), J. Mayhew (P), H. Robinson (C), R. J. Pearce (P), E. P. Plowman (P).
Clarendon House School, Lambeth :—N. Frankenstein (P).
Crosby Hall Evening Classes :—F. Marshall (E).
Bayswater Grammar School :—R. Ottley (C).
Great Western Railway Literary Society :—R. Perry (P).
Sheerness Mechanics' Institution :—W. Rickard (C).
Lewes Improvement Association :—E. S. Rouse (C).
Pimlico Literary Institution :—J. B. Rundell (P).
———————— :—R. F. Hosken (P).

Mensuration and Land Surveying.
23 Candidates.

London Mechanics' Institution :—Daniel Leggatt (E).
Royal Polytechnic Institution :—H. C. Smart (C), J. Lang (C).
Pimlico Literary Institution :—J. B. Rundell (P).
Bury St. Edmund's Commercial School :—Henry Robinson (P), E. P. Plowman (P), J. Mayhew (C), R. J. Pearce (C), H. George (C), F. Ford (P).
Sheerness Mechanics' Institution :—W. Rickard (C).
Great Western Railway Literary Society :—R. Perry (E).
Crosby Hall Evening Classes :—F. Marshall (P).
Oxford House School, Chelsea :—G. Godward (C).
Clarendon House School, Lambeth :—N. Frankenstein (C), C. H. Capper (C).
Devonport Mechanics' Institution :—J. W. Fletcher (E).
Messrs. Chance's Reading Room, Birmingham :—J. Duncan (P).
Boston Athenæum :—W. Dawson (P).

Trigonometry, 13 Candidates.

Pimlico Literary Institution :—J. B. Rundell (E).
Bury St. Edmund's Commercial School :—E. P. Plowman (E), R. J. Pearce (E), H. George (E), J. Mayhew (E), F. Ford (C).
Great Western Railway Literary Society :—R. Perry (P).
Crosby Hall Evening Classes :—F. Marshall (P).
Oxford House School, Chelsea :—G. Godward (P), A. W. Davis (P).
Clarendon House School, Lambeth :—N. Frankenstein (C).
Devonport Mechanics' Institution :—J. W. Fletcher (E).
Boston Athenæum :—W. Dawson (E).

Conic Sections, 9 Candidates.

Commercial School, Bury St. Edmunds :—E. P. Plowman (P), F. Ford (E), R. J. Pearce (E), J. Mayhew (P), H. George (C).
Great Western Railway Literary Society :—R. Perry (C).
Crosby Hall Evening Classes :—F. Marshall (P.)
Oxford House School, Chelsea :—A. W. Davis (P).
Boston Athenæum :—W. Dawson (E).

Nautical Astronomy, 1 Candidate.

Statics and Dynamics, 4 Candidates.

Devonport Mechanics' Institution :—J. W. Fletcher (P).
Lewes Mechanics' Institution :—C. A. Wells (P).
Pimlico Literary Institution :—J. B. Rundell (P).

Practical Mechanics, 3 Candidates.

Lewes Mechanics' Institution :—Charles Aspull Wells (E).

Hydrostatics and Pneumatics,
5 Candidates.

Clarendon House School, Lambeth :—H. G. Shea (P).
Devonport Mechanics' Institution :—J. W. Fletcher (C).
Pimlico Literary Institution :—J. B. Rundell (C).
Lewes Mechanics' Institution :—Chas. Aspull Wells (E).

Electricity, 4 Candidates.

Lewes Mechanics' Institution :—C. A. Wells (E).
Clarendon House School, Lambeth :—H. G. Shea (C), C. H. Capper (C).
Royal Polytechnic Institution :—B. J. Malden (P).

Heat, 5 Candidates.

Lewes Mechanics' Institution :—C. A. Wells (E).
Clarendon House School, Lambeth :—H. G. Shea (P), C. H. Capper (C).
Pimlico Literary Institution :—J. B. Rundell (C).

Chemistry, 15 Candidates.

Royal Polytechnic Institution :—W. J. Bull (E), S. E. Crow (P), B. J. Malden (C), F. Gaster (C), W. Groom (C). R. Earratt (C), W. W. Smith (C), J. Burney (C), J. Ebbs (P).
Lewes Mechanics' Institution :—Chas. Aspull Wells (E).

Physiology.—No Candidates.

Botany, 1 Candidate.

Louth Mechanics' Institution :—A. Hubbard (P).

Agriculture, 2 Candidates.

Hitchin Mechanics' Institution :—Joseph Pollard (E).
Louth Mechanics' Institution :—J. S. Bogg (P).

Political and Social Economy, 5 Candidates.

Royal Polytechnic Institution :—W. W. Smith (P).
Crosby Hall Evening Classes :—E. G. Clarke (C), Thos. R. Howard (P).
Boston Athenæum :—W. Dawson (E).
London Mechanics' Institution :—D. Leggatt (E).

English History, 7 Candidates.

Crosby Hall Evening Classes :—E. G. Clarke (E), Thos. R. Howard (C), Thos. Brodribb (E), Thos. H. Evans (E).
Clarendon House School, Lambeth :—A. G. Joy (E).

Geography, Descriptive and Physical, 13 Candidates.

London Domestic Mission Reading Room :—W. Evan Edwards (E).
Crosby Hall Evening Classes :—H. Cullum (E), J. Fretwell (E), T. R. Howard (E).
———————— :—J. H. Hosken (C).
Royal Polytechnic Institution :—J. Lang (E), W. W. Smith (C).
Commercial School, Bury St. Edmunds :—J. Mayhew (E), R. J. Pearce (P), E. P. Plowman (P).
Sheerness Mechanics' Institution :—W. Rickard (C).
Clarendon House School, Lambeth :—C. H. Capper (P).

English Literature, 8 Candidates.

Crosby Hall Evening Classes :—Thos. H. Evans (E), H. Cullum (E), Thos. Williams (E), T. H. Bolton (P).
Clarendon House School, Lambeth :—H. G. Shea (E).
Tailor's Labour Agency :—John Smurthwaite (P).
———————— :—R. F. Hosken (P), J. H. Hosken (C).

Roman History and Latin, 12 Candidates.

Crosby Hall Evening Classes:—E. J. Badham (P).
Louth Mechanics' Institution:—J. S. Bogg (P).
Richmond Parochial Library and Reading Room:—W. H. Callanan (P).
Bury St. Edmund's Commercial School:—H. George (E), J. Mayhew (P), R. J. Pearce (E), E. P. Plowman (P), H. Robinson (E).
Clarendon House School, Lambeth:—A. G. Joy (P).

French, 21 Candidates.

Royal Polytechnic Institution:—J. H. Bacon (C), L. Desgratoulet (P), C. N. North (C), Job Elliott (E).
Crosby Hall Evening Classes:—T. Brodribb (E), J. Fretwell (P), Thos. Williams (P), A. G. Gillingham (E), F. Marshall (E).
Clarendon House School, Lambeth:—A. Crawley (C), N. Frankenstein (E), A. G. Joy (P), J. C. Purssey (E), H. G. Shea (P).
Oxford House School, Chelsea:—A. W. Davis (P).
Bayswater Grammar School:—H. Houghton (P), R. Ottley (P).

German, 7 Candidates.

Crosby Hall Evening Classes:—T. Brodribb (E), J. Fretwell (E), Ed. Steele (E).
Clarendon House School, Lambeth:—N. Frankenstein (E).

Freehand Drawing, 2 Candidates.

Lincoln Mechanics' Institution:—Robert Slingsby, jun. (E).

Mechanical Drawing, 3 Candidates.

Oxford House School, Chelsea:—A. W. Davis (E).
Lewes Mechanics' Institution:—C. A. Wells (E).

The **Secretary** then read the following list of subjects which had been suggested for discussion:—

I. The Society's Examinations.
II. How far and in what way may public opinion be brought to bear more effectually to promote the objects of the Society and the Institutions in Union?
III. How can the National Museums be made more generally useful to the public?
IV. Exemption from Rating Bill.
V. Statistics of the Institutions.
VI. To urge on the Government the importance of securing the Soulages Collection for the public.

The **Chairman** said, it would be gathered from the above report, that the objects contemplated by the Society in its examination were working very satisfactorily indeed. In the second year of the examinations, they found that the number of candidates had multiplied five-fold, and he hoped that the Mechanics' Institutes, throughout the country, would continue to encourage the formation of evening classes for adults, and that from them they would, on future occasions, have aspirants for distinction who, it was to be hoped, would be able to avail themselves of additional local centres of examination, the introduction of which the success of the plan hitherto certainly seemed to justify. His own personal view was, that Mechanics' Institutes should be looked upon as educational institutions for the benefit of those who, in early life, had been called into the various fields of labour; but, as a general rule, he feared that those Institutions were too poor to be able to carry out all that was expected of them. It might, therefore, be a matter for consideration, whether they should not receive small grants in aid. It was clear that the Society of Arts could not, by its own means, carry on the system of prizes that had been initiated. During the last year the sum of £500 had been subscribed by philanthropic members of the Society, but he was afraid that could not be looked upon as a permanent element, and would be liable to great fluctuations from year to year. It was, therefore, he thought, highly desirable that the prize fund should be placed upon some more permanent footing. Another matter to be considered was, that the examinations had been conducted by gentlemen, some of them of the highest distinction in literature and science, whose time was most valuable, and as the number of candidates increased, it could not be expected that those gentlemen could continue to give their gratuitous services on such occasions. That was, therefore, a matter for which provision must be made, and if the examinations were to be conducted by first-rate men, they must make it worth their while to undertake the labour. The object, therefore, should be to organise a permanent system, free from all risk of failure from the causes to which he had adverted.

Mr. **James Yates** (Highgate Literary and Scientific Institution) desired, on the part of the delegates present, to express the satisfaction which they must all feel at hearing the reports of the Examiners just read. He would take upon himself to express the gratitude which they must all agree was due to the Examiners for their gratuitous labours, and on behalf of the delegates he begged most heartily to thank them.

Col. **Sykes** stated that as he was compelled to attend the meeting of the Court of Directors of the India Company, he had reluctantly to excuse himself from remaining longer, and he begged to call upon Dr. Booth to take the chair.

The Rev. Dr. **Booth**, having taken the chair, announced that the first subject for discussion was,

The Society's Examinations.

The **Chairman** suggested that on this subject it might be well to consider, looking at the satisfactory results of the late examinations in London and Huddersfield, how far the centres of examination might be extended, and how far additional inducements might be held out to persons to come up for examination. This year they had had only two, which virtually excluded large districts of the country. They had received an invitation from the south of England to appoint a centre of examination for that district, but the consideration of the subject was obliged to be postponed. The council of the Society had hardly contemplated so rapid a growth of the plan as had taken place during the two years that it had been in operation. It was also gratifying to find that the three universities of England, together with that of Dublin, as also the Royal Society of Dublin, which was similar in its character to the Society of Arts, had marked their approval of the system they had adopted by imitating it themselves.

The Rev. E. **Kell** (Southampton Polytechnic Institution) said the members of the Institution which he represented were most ready to co-operate, if it should be thought expedient to fix upon Southampton as a centre of examination for that district of the country. He wished to know whether the examinations would include persons educated at the higher classes of schools? if so, he thought many would be disposed to submit themselves to an examination of that kind. He was sorry to add, that he could not say much for the state of the Institution which he represented, nor indeed for any similar Institution in the south of England, as regarded the number of class students; but, at the same time, he thought, from the district of Southampton a sufficient number of candidates might be brought together to make it worth while for a deputation from the Society to attend there on a future occasion.

The **Chairman** said the rule laid down by the Board of Examiners, and confirmed by the Council of the Society, was not to examine any person who was actually at school. The Universities of Oxford and Cambridge, as well as the College of Preceptors undertook the examination of boys at school, but, in their own case, it was a special regulation that no person who was at school, or under 15 years of age, could be included in those examinations.

Mr. Arthur Ryland (Birmingham and Midland Institute) would put the case of a person having received a good education at school becoming a member of a Mechanics' Institute by a guinea subscription. Could such a person compete in the examinations? He would suggest the importance—as regarded the object they had in view—of confining the candidates to persons who had mainly received their education in the classes of Mechanics' Institutions, rather than to extend it to those who had received a good education either at public or private schools.

The Chairman said they had, as far as possible, shut the door against this by the regulation that no person under the age of 15, or at school, should attend the examinations. At the same time, he thought it was hardly competent for them to go back to the previous life of every candidate, and inquire how he had gained his information. That might be considered a proceeding of a somewhat inquisitorial character. What they required was the certificate of the Secretary of the Institution from which the candidate was sent, and he thought the Institutions were quite competent to protect themselves in the matter alluded to.

Mr. Ryland did not suggest that any such inquiry should be made by the examiners, but he thought the rules laid down should be a sufficient guide to the officers of Institutions, so that the candidates might be confined within certain limits.

Mr. Thomas Chamberlain, (Windsor and Eton Literary, Scientific, and Mechanics' Institution), mentioned that in the case which occurred the previous year, in which a candidate gained a prize together with an appointment in the Privy Council Office, it had been complained of that he had had superior educational advantages as a pupil teacher in a public school. He was glad to find that persons so situated had this year been excluded from the examinations. He thought the suggestion worthy of consideration, that some limitation should be put upon the admission of such as had been able to obtain a high class of education previously to joining a Mechanics' Institution.

The Chairman said it was difficult to lay down rules in such cases. To bring the examinations to meet the wants of the lowest grades of information would destroy their value. He might remark that their best men had not come from schools, but had principally received their education in Mechanics' Institutions. A certain standard had been fixed by the examiners, within which all must come. Energy and perseverance were of more value than mere educational advantages. It was altogether impossible to legislate for every individual case. They had, however, shut the door against pupil teachers and boys under 15 years of age.

Mr. Barnett Blake (Yorkshire Union) thought the objection taken, was purely imaginary. He considered that competition had nothing to do with the question, and he believed the prize fund formed the least part of the inducement to candidates to come up for examination. The certificates awarded, whether to a student at school or at the evening classes of an institution, were in themselves of equal value to those who obtained them. He repeated that it was not a competitive examination, but each stood upon his individual merits, and all candidates who attained to a certain standard, were alike sure to obtain their certificate. Since their last meeting in this room, he had addressed some hundreds of audiences upon this subject, pointing out the value of these examinations, and the importance of this movement on the part of the Society of Arts; at the same time making inquiries as to how far the matter affected them. He was much gratified at witnessing the great increase in the number of candidates as compared with the first year. The county he represented had furnished 150 candidates, and if the examinations in Yorkshire were repeated, he had no doubt the number would be very greatly increased on the next occasion. There were a number of Institutions in the Yorkshire Union which sent no candidates at all. He had inquired the reason, and found that they heard of the Examination too late in the year to be able to make any preparations, but they said "give us another year and let us have earlier notice—and see what we will do." His chief object in rising was to express a hope that the Council would—at least as far as Yorkshire was concerned—again afford the privilege of a central Examination for that county. For his own part he would say—abolish the prize fund altogether if they pleased, as he believed in the Society's certificate alone there was sufficient inducement to young men to come up for examination. Last year the Associated Institutions of Lancashire and Cheshire resolved upon a local examination of candidates from those two counties, but he thought it improbable that their certificates would be considered as valuable as those of the Society of Arts, and he believed the Council might be called upon hereafter to appoint two centres of examination in the north. He claimed for the Yorkshire Union that they would not go back, after the successful examination that had taken place; and he believed the Society need entertain no anxiety with regard to the prize fund, for he thought that was the last inducement to the candidates. If, indeed, a prize fund were required as a stimulus, he believed the people of Yorkshire would raise such a fund amongst themselves sufficient for the purpose. He agreed with the chairman that it would be found that those who carried off the highest honours in the Examinations were persons who had chiefly derived their education through the instrumentality of Mechanics' Institutions. At previous conferences mention had been made of the difficulty of obtaining attendance at the evening classes. He would mention that amongst 53 Institutions in the Yorkshire Union, comprising 8,000 members, 4,000 of that number were pupils in the evening classes, and the number was rapidly increasing. Amongst these he felt sure that the certificate of the Society of Arts would be ample inducement to prepare themselves for examination. He hoped the next year would witness another examination in some town in Yorkshire.

The Chairman said, he thought the Board of Examiners would announce their scheme in the early part of the next official year. He would take the opportunity of remarking that he thought the advantages to be derived from an education in public or commercial schools, had been overrated by those delegates who had drawn attention to that subject. Experience showed that it was not the school, but the energy and application of the individual himself. In illustration of this he mentioned instances, in the recent examinations, of the candidate No. 149, a youth from Lincolnshire, who had acquired proficiency in drawing without the assistance of a master; and that of the clerk in an attorney's office at Lewes, who had obtained six first-class certificates and, in some cases, getting the full number of marks. The same might be said with regard to a candidate from the Boston Athenæum; therefore, it was not the school the man came from, but his own energy and ability that carried him through.

Mr. Frank Curzon (Huddersfield Mechanics' Institution) attached much value to the condition that the candidates should have joined the classes of an Institution six months previously to the examination.

The Chairman said that rule still existed.

Mr. Frank Curzon said he was afraid it had not been in all cases strictly adhered to. He thought if it were enforced, it would have the effect of continuing classes that were suspended in the summer months. He would state that an earnest desire prevailed at Huddersfield for the repetition of the examination. Although they might have to meet persons educated in the commercial schools, they did not fear the result as regarded the pupils of the Institutions; and, perhaps, the only point in which the latter stood at a disadvantage was that they could not with facility commit their thoughts to writing, inasmuch as many persons, previous to their joining the Institutions, could neither read nor write, and some had no knowledge even of the first elements of arithmetic.

The Chairman said it was a feature in the certificates that they were absolute, and not relative. Those who came up to the standards fixed by the Examiners, obtained either first, second, or third class certificates. If they did not reach that standard, they obtained no certificate at all. For instance, as no candidate had reached the standard fixed in nautical astronomy, no certificate was granted under that head, and it was the same with regard to all the branches of examination. With reference to the prizes, he was convinced that the mere giving of a few books would never induce a person to study week after week, and month after month, to obtain knowledge, this was done with a far higher aim. Difference of opinion had prevailed as to the mode in which the examinations should be conducted. Some persons were in favour of written examinations alone, whilst others (and he was of the number) preferred a combination of written and oral examination, inasmuch as, by each of these means, a different set of faculties was brought into action.

Mr. James Yates agreed in opinion with the Chairman. He entertained this partly on the ground that he thought the examinations ought, to a certain extent, to be publicly conducted; this would give a greater interest to the occasion. He was one of those who thought it desirable to admit to the examinations those who might have received a somewhat higher education than the generality of candidates. He thought in the class of subjects included in these examinations, the pupils of classical schools would not have any great advantage over others, inasmuch as the classical languages did not enter very much into these examinations, but they were rather confined to those matters which formed the usual subjects of study in the classes of Mechanics' Institutions. He also thought the fact of having candidates from the higher classes of schools gave an additional value to the examination in the same way that the admission into the British Schools of the children of parents who could afford to pay for their education tended to raise the character of such schools. He thought it was the same with regard to their examinations, and that the competition was the more honourable if persons of a superior order entered into it. He quite subscribed to the adage that talent and success were not confined to any rank of life.

Mr. H. Brown (Lewes Mechanics' Institution) said, if the centres of examination were to be increased, it appeared to him that some exertion would be necessary on the part of the several localities so favoured in assisting to defray the great expenses that such a plan would entail. He would suggest that a communication should be opened with the provincial Institutions, in order to ascertain what amount of local assistance could be obtained in carrying out the proposed measure of having additional centres of examination, which, of course, involved the employment of a larger number of examiners.

Mr. McIvor (Leeds Mechanics' Institution) did not think any attempt to raise local subscriptions would be attended with success. The great complaint with almost every Institution was, that they lacked the funds necessary to their own well-being. It had been stated that it was required of the candidates for examination, that they should be *bonâ fide* pupils of the classes of an Institutions. Such, in his opinion, was not the language of the condition; it was required that they should be members of a Mechanics' or Literary Institution, but not that they should be pupils of the classes. He thought it was important that it should be made a condition that the candidates should have been for six months pupils of a class in an Institution before they appeared for examination. He would also venture to make the suggestion, that the language in which some of the questions were put was of somewhat too philosophical a character to be understood by the majority of the candidates, and he thought some simpler form advisable.

Mr. Thomas Winkworth was unwilling that the discussion upon this subject should close without (as a member of the Council) saying a word or two upon it. He was confident that the Council regarded with great respect, and with every desire to promote the objects which the Institutions had in view, all the remarks which had fallen from the various speakers in the course of the discussion of this particular point; but he thought to come to anything like a decision at the present time would not only be premature, but might involve them in some mistakes. It was known that the three great Universities of this kingdom had taken steps analogous to those which had been initiated by this Society, but it might turn out in practice that that system required some modification. Fortunately a good deal of time would be before the Council, during which they would have an opportunity of collecting, in various ways, the opinions of persons not now present, and this might be especially done through the columns of the *Journal*. He was sure the Council would entertain this subject with a view, as far as possible, to fall in with the suggestions which had been offered.

Mr. Chamberlain wished to explain that his notion was that persons in the middle class of life who had received a superior education seemed to desire to avail themselves of the much-valued certificate and prizes of the Society of Arts; and he thought it was unfair to those less fortunately situated with regard to educational matters that they should come into these examinations and be placed face to face with those who had had a superior education in their earlier years. The latter obtained a good education in the first instance, and then joined an Institution as a means of coming up for the honours of the Society. He would express a hope that in the event of the entries of examination being increased, due care would be taken by the Council with regard to the strict impartiality of the examiners. He mentioned this because the Bucks and Berks Association had announced that they were about to hold an examination of the Institutions in Union with them; but he (Mr. Chamberlain) objected to examinations conducted by an association the managers of which were of a very exclusive character, being composed almost entirely of young clergymen of the Church of England; indeed, it was not till lately that there were any laymen in the management.

The Chairman remarked that it would be sufficient to discuss their own affairs without interfering with those of other Societies. He would add that wherever centres of examinations were fixed, the examiners would be appointed by the Society of Arts. Whether these centres were few or many, the same strictness and impartiality would be exercised by the examiners as if the examination took place at the parent Society in the Adelphi. Whatever responsibility the Council of the Society undertook in that respect, they would carry out faithfully and strictly.

Mr. Whitwell (Peterborough Mechanics' Institution) considered that the examinations were beneficial in creating a sort of standard for the efforts of the members of Mechanics' Institutions, and a stimulus to acquire proficiency in those branches of learning for which the prizes were offered. He thought it would be well that each Institution should send picked men from their number to enter the examinations, which would in itself be a mark of distinction in the locality to those so selected.

The Chairman was obliged for having his attention called to a matter which he had overlooked. He should have stated that the Institutions had been invited to establish preliminary examinations—to sift, as it were, from amongst their number the candidates whom they would send up for examination—the "picked men;" because if these examinations were to go on it would be a matter of serious labour to the examiners, and the papers of the bad candidate gave more trouble than those of the good candidate. Therefore he thought on future occasions, seeing the large increase in the number of candidates that had taken place, it was very desirable that preliminary examinations should be established, as had been done at Wakefield on the last occasion, by means of which the labours of the examiners would be lessened and the benefits of the whole system would be extended.

Mr. J. C. Buckmaster (Royal Polytechnic Institution) thought they ought not to shut their eyes to the actual state of the Institutions; how far they were able to assist in this movement. A great deal was said about what Institutions might do and ought to do, and had done, but he would say of all the Institutions in Union, comparatively few amongst them had sent candidates for examination. How was it they had not done so more generally? Simply because they had no organisation with a view to these examinations. In very few of the Institutions were there classes in which to prepare candidates, notwithstanding an attendance at classes was a condition of the examination. A large number of the Institutions in the Union were unable to do anything towards preparing candidates for examination. They were aware that these Institutions were, for the most part (and he should be sorry to see that element wholly neglected), places of recreation and amusement. The working classes, for whom those societies were mainly intended, did not, as a general rule, much frequent them, and he thought they would arrive at the real reason for this if they spoke the truth plainly to each other. Let them carry their minds back to the Institutions which they severally represented, and say what they could do with their present organisation towards forwarding the scheme now under consideration? Although he did not attach an inordinate value to lectures as a means of instruction, still he thought they were important, and ought to be encouraged. He thought systematic courses of lectures on the subjects embraced in the examinations would serve as a guide to many who were travelling in an unknown road. They might help the student, but the real hard work must be done by the man himself. What was done by the great majority of the Institutions in this respect? If he inquired how many of them had classes for systematic instruction, he believed they would be found to exist in very few. It appeared to him that lectures without class instruction in the subjects treated of, were of no practical utility. He thought classes ought not to be made subsidiary, but that they should be the great end and aim of every Mechanics' Institution. It might not be out of order if he ventured to state what seemed to him to be the proper course. He believed that with very few exceptions indeed good and talented men could be found in every locality able and willing to instruct the classes, but the fault was with the members themselves. The classes started at the Polytechnic Institution last autumn, were with especial reference to these examinations; but for the establishment of these examinations those classes would probably not have been formed. There were 500 pupils in those classes last September, the major portion of the candidates from which were those who lived by their daily labour. Each person was limited to three subjects. The classes proceeded in the most creditable manner, and out of 53 candidates, 49 of the number obtained certificates, and he was satisfied that the same thing might be done at half-a-dozen other points in London, if only people had the energy and determination to set about it. It was not from indifference on the part of those connected with this Society, but from apathy on the part of the Institutions themselves that the advantages offered by this scheme of examination were not more generally extended.

Mr. Barnett Blake expressed his dissent from the opinion of the last speaker with regard to the position of Mechanics' Institutions. He could bear testimony to the existence of a different state of things in the north of England.

The Rev. Alexander D'Orsey said, every practical teacher was aware of the advantages and disadvantages both of written papers and oral examination, for whilst in some instances the candidates were of so nervous a temperament that they could not answer a question orally, on the other hand persons well versed in the subject upon which they were examined had not facilities in English composition, and were at a loss to commit their thoughts to paper. He then described a method which he had adopted of overcoming these difficulties.

The Chairman remarked that these were matters of detail which required much consideration.

Mr. H. Hemington Harris (Cambridge Mechanics' Institution) said, in this discussion but little regard seemed to be paid to the examiners themselves. He thought the examiners were the proper persons to decide how they were to conduct their examinations, and that they should be interfered with as little as possible. As to the throwing the examinations open to the public, he thought it would be an annoyance and impediment rather than an advantage, and would entail additional trouble upon the examiners. He agreed with Mr. Buckmaster that for some years past the title of Mechanics' Institutes had been a misnomer, judging from the amount of support which was received from the working class generally.

Mr. McIvor remarked that the subjects for examination embraced chemistry, for the illustration of which a laboratory and apparatus were required, which could not be always available; and the same might be said with regard to the illustrations of mechanical science. He thought, however, it was in the power of the members of Institutions of various trades and occupations to get up suitable apparatus for themselves. So also in the study of geology practical illustrations were required, for, although a student might be well crammed with book knowledge, he might be practically ignorant of the construction of rocks and minerals.

The Chairman begged to make a suggestion which he thought would facilitate the scheme of examinations. It was that on the return of the delegates to their respective Institutions, they should communicate to the Council of the Society which localities in each district would be suitable as centres for holding the examinations next year. From such returns the Council might make their selection, so as to distribute these centres as equally as possible over the area of the country. In his opinion, the centres ought to be determined and made known not later than the month of September, and the students could then make their selection of the subjects upon which they desired to be examined. The Chairman added that it had been resolved to hold the next examination in London, in the Whitsun week, as, being generally a holiday amongst the operative classes, it would give better opportunity for their attendance.

Mr. Frank Curzon remarked that there was no one within 50 miles of Huddersfield qualified to give instruction in physiology. He believed, if a competent person would state what salary would induce him to take up his residence in the north, by a union of the Institutions of the large towns like Halifax and Wakefield for that purpose, a qualified lecturer on that science might be fully employed.

How far and in what way may Public Opinion be brought to bear more Effectually to Promote the Objects of the Society and Institutions in Union.

The Chairman said at the time of the Union of Institutions, the *Journal* of the Society was established in its present form, almost entirely with reference to the interests of the Institutions themselves. It was hoped, at the time, that the *Journal* would have formed a valuable medium of communication and correspondence between the various Institutions, in which also plans for their mutual benefit and improvement would have been discussed. He, however, regretted to state, that very little use had been made of the *Journal* for these purposes, and he must be allowed to express his opinion, that in this respect the Institutions had been somewhat unmindful of their own interests. The communications received from the provinces generally consisted of inflated and lengthy accounts of meetings and fêtes at Institutions, whilst there was an almost entire absence of those practical and useful communications, for the encouragement of which the *Journal* had been established.

Mr. Barnett Blake had no doubt that the state of things which had called forth these remarks from the chairman had arisen mainly because the Institutions were not aware of the fact that such communications would be acceptable. If he had known that such was the case, he should have troubled them with several communications upon what he thought important matters affecting their general interests. He agreed with the chairman that such a medium of intercommunication was of very great value, and he had no doubt the remarks which had been made would not be lost upon the meeting.

The Rev. E. Kell thought that what told most against the success of the Institutions was the want of funds. In many of those in the South of England there were no classes for instruction, or at least no good classes, and, therefore, it could hardly be expected that such Institutions would be very likely to send communications to the *Journal*. Many of them could not afford to pay the rent of their buildings. He did not know an Institution in the south which was not more or less encumbered with debt. He was almost afraid to state the debts of his own Institution in Southampton. They were paying £70 a-year for the room in which their lectures were held, and they were upwards of £200 in debt. Indeed, they had to appeal to the benevolent and philanthropic men to assist them. He was of opinion that the authorities of towns should provide buildings for these Institutions, knowing how much benefit they were calculated to confer upon society at large, and he thought such reasonable aid in so good a cause ought not to be withheld.

Mr. Curzon remarked that in his opinion the funds were not obtained from the working classes in the proper way.

The Chairman begged the delegates to keep to the question before them, which was that of the *Journal* of the Society. He thought that the members of Mechanics' Institutions possessed a power which, if properly brought to bear, was greater than perhaps they had any idea of. Members of Parliament were extremely sensitive to the feelings of their constituents on matters of this kind, and many important measures of great social interest had been conceded upon an expression of opinion, which it was thought proper not to disregard. Whilst making these remarks he had in his mind the Rating Bill of last year, which was at first opposed by the government, but eventually it was read a second time in the House of Commons, and the government intimated to Mr. Hutt that they would offer no further opposition; but it was too late in the session to get the Bill passed. The Bill had been reintroduced this year, and was probably at that moment under discussion in the House. It was in matters of this kind that the advantage and influence of an organ representing the views of the various Institutions was of the greatest importance.

Mr. S. L. Rymer (Croydon Literary and Scientific Institution) thought one means of creating public interest on their behalf was by making it apparent that they were promoting a great public and social good. He agreed with Mr. Buckmaster, that the great majority of the Institutions were without any systematic classes for instruction. Of all the Institutions with which he was acquainted—and they were many—the great majority had no classes. He, however, did not agree with Mr. Buckmaster in the small estimate which he appeared to put upon lectures. He thought, if they had first-class lecturers instead of mere quacks, they would have no difficulty in filling the lecture-rooms. He might mention that, three years ago, the Croydon Institution did not number more than about 50 members; but, upon a change of management taking place, and by the introduction of lectures and entertainments of a high character, they now numbered upwards of 400, and their proceedings were regarded with much interest by the inhabitants of the town. He thought there was a great want of a good work upon self-culture, and he suggested that a premium should be offered for the best essay on that subject. He thought the value of the broad-sheet in their reading rooms was overrated, and he should like to see such publications as the *Quarterly Review* and other high-class literature upon their tables. These were of more solid interest than the daily or weekly newspaper.

The Chairman said, no doubt first-class lecturers would draw first-class audiences, but the difficulty was to get the lecturers.

Mr. Thomas Chamberlain expressed his opinion that Institutions of this kind ought to receive some support from the public purse, as was the case with the Free Libraries. He thought a small rate for the purpose would not be objected to.

Mr. Barnett Blake suggested that the further discussion of this subject should be carried on in the *Journal*. He believed that Institutions, properly managed, were capable of supporting themselves.

Mr. J. C. Buckmaster said his attempts, as also those of gentlemen connected with the Society of Arts, to provoke discussion in the *Journal* on points of interest to them all, had completely failed. He was convinced that the *Journal* might be made a most important vehicle of intercommunication and interchange of thoughts upon subjects like that now before them. He confessed he was not so satisfied with the Institutions with which he had been connected as the delegate from Yorkshire appeared to be with regard to those in his own district, for he could say he did not find the working classes of the south so ready to support these Institutions. With regard to lectures, no doubt the best article would fetch the best price, as was the case with everything else. Lectures had probably failed to prove attractive because they were given gratuitously; and the same remark equally applied to class teaching. There were quack teachers as well as quack lecturers. With regard to Mr. Ewart's bill for establishing Free Libraries, he did not think so much had been done as might have been expected. He knew that in London very little had been done. The City of London had refused to recognise the bill, or even to contribute a farthing towards the support of the Crosby Hall Schools; the Marylebone Free Library was closed; and the Islington people had refused to recognise the bill. But with all these discouragements some towns fortunately possessed sufficient interest to avail themselves of it. He was strongly opposed to pauperising education; he would say, let them do all they could for themselves, and not call in the assistance of others.

Mr. George Dawson thought the sooner the cry, that Mechanics' Institutes were a failure, was done away with the better. It might be true that they had not succeeded with regard to classes to the extent that was anticipated, but still they were not a failure. In many of the towns in the south of England they had flourishing Institutions, both as to the number of the members and the state of the classes. Another error he thought was the outcry against lectures, although, perhaps, he ought not to be the person to say so. It was absurd to say that because an Institution could not afford to pay for a series of half a dozen or a dozen lectures, therefore there ought to be no lectures at all. The penny working men's lectures in Birmingham and other large towns, had been successful in bringing together very large audiences. He gave it as his opinion, that payments in advance operated prejudicially to Mechanics' Institutions. Working men did not like payments in advance; they would readily pay their penny down and attend a lecture, even though they expended in that manner more pence than the quarter's subscription came to. He mentioned other instances in which lectures were provided for by tickets of subscription being taken sufficient to defray the whole expense of the lectures, and in such cases, whilst there was no lack of an audience, the secretary and committee who might have taken the responsibility upon themselves, were not in a state of trepidation at the unfavourable state of the weather for securing a numerous audience, to reimburse the amount for which they were, perhaps, personally responsible. He strongly recommended a reconsideration of the question of subscriptions to the Institutions by the working classes, and he thought a weekly subscription would answer better than the present plan.

Mr. J. M. Wade (London Domestic Mission) suggested that a list should be published by the Society of the books most suited to the classes on the subjects proposed for examination. He agreed as to the value of practical teaching, but in many cases knowledge could only be derived from books. With regard to the present position of the Institutions he believed that if proper means were employed to make them successful, success would not be wanting. He thought there never was a time when more desire was displayed by the working classes to obtain information, or when they were more alive to the advantages of education, and he believed if they made the Institutions more worthy of support, they would have no reason to complain of a want of interest in them on the part of the working classes; and when a worthy object was presented, he had always seen the utmost readiness on the part of the wealthier classes to contribute their support to such an object. He believed great difficulty was experienced in getting proper teachers for the classes,—he referred to gratuitous teachers. He did not wish to say a word against paid lecturers, but he believed in every neighbourhood there were gentlemen who would be willing to give lectures, if an audience could be secured, and they were received with becoming earnestness and attention.

Mr. McIvor suggested the formation of central committees to co-operate with the Society on the subject before them. He also thought great benefit would be derived from the countenance of large employers of labour being given to these Institutions. By that means local nuclei would be formed, and the Institutions would become as it were popularised.

Mr. Whitwell (Peterborough Mechanics' Institution) gave a statement of the progress of the Institution which he represented, and spoke of the necessity for adapting the Institutions to the peculiar requirements of the localities where they were established.

Mr. Curzon suggested the employment of an agent in certain centres to describe, in a popular way, the advantages of these Institutions. He recommended that a circular should be addressed to the Institutions in Union, calling upon them to suggest centres for carrying out this object.

The Chairman said, if Mr. Curzon had had experience in the office of the Society, he would be convinced of the utter inutility of sending out circulars to the Institutions, either for that or, indeed, for higher objects. They had sent out circulars—not by hundreds, but by thousands, and the result would lead to the supposition that not half of them could have ever been opened. He instanced the fact that 1,200 circulars were sent out to all the Institutions in the kingdom, requesting information on matters relating to the question of the rating of Institutions, which, of all others, was one in which they might be expected to feel the greatest interst—and out of that large number not more than about 250 replies were received; so that the object of the Society, in hoping to be able to lay a mass of valuable information before Parliament on the subject of rating, was completely frustrated by the neglect in sending back returns which could have been furnished with little trouble. With regard to the publication of a list of books suitable for classes; that had already been done, to the extent which the Council considered they were justified in going. It had occurred to him personally that it might be desirable that the certificates should carry with them the title of Associates of this Society, as a degree analogous to those conferred by the Universities. He did not make that statement officially, but merely as a suggestion of his own.

The Rev. Peter Wood (Devizes Literary and Scientific Institution) gave some statistics relative to an Institution which he had visited in Dublin, and which exhibited the appearance of great prosperity, with large attendances at classes, for which separate payments were made.

"How Can the National Museums be made more Beneficial to the Public?"

Mr. McIvor mentioned that the Department of Science and Art had established a museum of objects of art, which was sent through the country. He expressed his opinion that great advantages would be gained by the establishment of local museums of objects of interest, with the peculiar productions of the various districts. He thought it was within the means of every Institution to form the nucleus of such a museum.

Mr. Whitwell suggested that application should be made for some of the surplus specimens of natural history from the British Museum, which he said was already overcrowded with specimens.

Mr. Barnett Blake could not see any advantage to be derived from such a grant, which he thought would not be worth the carriage.

Mr. Yates remarked, with reference to museums, that unless they had a good staff of officers, and a good building, a museum would fall into neglect, and become almost worthless. He saw no good to be derived from the exhibition of stuffed skins of animals, and the huge horns of oxen and buffaloes. The only way to make a museum useful was to make it practical and serviceable to the locality in which it was placed. Mr. Yates expressed himself favourable to the opening of the National Museums on the Sunday.

The Chairman expressed himself in favour of the establishment of local museums illustrating the geology, flora, and other objects of interest of the district, but questioned, with Mr. Yates, the value of an exhibition of stuffed animals. He knew quite enough of the matter to be able to state that no application, such as that Mr. Whitwell had suggested, to the authorities of the British Museum, would be attended with success, unaccompanied by an expression of opinion on the part of the legislature.

Mr. Buckmaster spoke in favour of local, practical museums, as valuable aids to instruction.

The Rev. E. Kell stated that excellent museums had been established at Southampton and the Isle of Wight, and they found objects of considerable interest in those localities.

Mr. Austen (Battersea Mutual Improvement Society), thought that with the objects of interest which might be collected in each locality at a moderate expense, an interesting practical museum might be attached to each Institution. He did not know whether the Society would be in a position to aid a movement in this direction.

Mr. F. Spurrell (Bexley Heath Useful Knowledge Society) offered some similar observations; and after a further conversation,

Mr. Buckmaster moved the following resolution, which was seconded by Mr. McIvor, and carried unanimously:—

> "That this conference is of opinion that natural specimens of wood, stone, metals, and other raw materials, chiefly illustrative of the trade and industry of the country, would be valuable to the Institutions in Union, as a means of education."

Mr. Winkworth begged to draw attention to the ensuing visit of Members of the Society to Manchester. The Committee there would be quite anxious to afford all possible facilities for seeing the Exhibition, in as short a time as possible; and those visitors who might desire the assistance or opinions of qualified gentlemen in their several departments of art and science, in their walks through the building, would no doubt be gratified by an organised system of sectional visits. Certain public buildings, factories, and princely warehouses, would be thrown open to the members on production of their tickets. Excursions to places of interest in the neighbourhood might possibly be suggested and arranged. Reunions, whether for artistic or scientific discussion, or social intercourse, would also be promoted. An effort would be made to get cheap excursion trains during the proposed period of the visit placed at our disposal. As soon as the authorities of the Manchester Exhibition were relieved from the engrossing details connected with Her Majesty's visit next week, an effort would be made to prepare a programme, more or less dependent on the numbers who might, sufficiently early, declare their intention to go there on the proposed occasion.

Exemption from Rating Bill.

Upon this subject, Mr. H. W. Freeling (Chichester) brought forward suggested amendments in the clauses relating to the rating of reading-rooms in connection with the Institutions, also with reference to the exemption from rating of such portions of the building as were occupied by a curator or other officer.

The Chairman and several delegates expressed their opinion that as, in all probability, the fate of the Bill was at that moment decided by the House of Commons, it was useless to enter upon the subject. The propriety of interference with the clauses was questioned in several quarters, as it might endanger the success of the whole measure, relative to which considerable diversity of opinion prevailed.

Statistics of Institutions.

The Secretary called the attention of the Conference to the difficulty experienced by the Society in obtaining the statistics of the Institutions in Union. Although several applications to the Institutions for their statistics had been made, in a few instances only replies had been furnished.

Several delegates promised that this matter should be duly represented, and they had no doubt more attention to such matters would be given in future.

Mr. Barnett Blake then proposed a vote of thanks to the Chairman for the able manner in which he had presided over the Conference, which was seconded by Mr. Thomas Chamberlain, and carried unanimously.

ANNUAL GENERAL MEETING.

Wednesday, June 24, 1857.

The Annual General Meeting for receiving the Council's Report, and the Treasurers' Statement of the Receipts, Payments, and Expenditure during the past year, and also for the Election of Officers, was held on Wednesday, the 24th inst., at 4 p.m. Colonel Sykes, M.P., F.R.S., Chairman of Council, presided.

The Chairman, in opening the proceedings, said, that by the bye-laws, he was directed to nominate two gentlemen to act as scrutineers of the ballot for the election of officers. He would ask Messrs. W. Bridges Adams and F. Lawrence to undertake that office.

These gentlemen having consented to act, the Chairman declared the ballot open. He then called upon the Secretary to read the

ANNUAL REPORT.

The Charter which places the government of the Society in the hands of the Council, enjoins that the Council shall annually lay before the members an account of the manner in which they have discharged the duties entrusted to them. In fulfilment of this fundamental law, the Council now proceed to report their labours of the present year.

Bye Laws.

The success which last year attended the Examinations established by the Council, rendered it desirable that the system should be placed on a permanent basis, and the Council, therefore, brought before the Society, at a Special General Meeting, in October last, some additions to the bye-laws, which would provide for the permanency of, and give further efficiency to those examinations by establishing, as part of the general action of the Society, a Board of Examiners, with regulations for their guidance and succession. These additional bye-laws with others brought forward by the Council at the same time, for creating a staff of Honorary Local Secretaries, and forming a Union of Colonial Institutions, so as to extend the sphere of the Society's action abroad, all of which had previously been carried out under the general governing powers of the Council, were duly passed at the General Meeting, and these matters now form an integral part of the Society's constitution. The increased numbers attending the Examinations this year which have just taken place, and the marked improvement in the character of the knowledge displayed, fully justify the step the Society has taken in that direction.

It will be gratifying to the members to learn that since the last report three of the individuals who were successful in the last year's Examination have obtained public appointments, one, Charles Chambers, as an assistant observer at the Kew Observatory, and two others, Robert Abbott and Wm. Matthew Taylor, situations as clerks in the Privy Council office. The Lord President of the Privy Council, Lord Granville, one of the Society's Vice-Presidents, having five vacant clerkships at his disposal, gave the Society of Arts the privilege of nominating two of its successful candidates to compete for these situations, and both of those nominated by the Society were successful against twenty-two competitors.

This year the Council fixed on two centres for examination to suit the convenience of candidates, one being held at the Society's house, and the other at Huddersfield. While the examination last year numbered 52 candidates, this year they were increased to 230.

A special Prize Fund has been subscribed in aid of these Examinations, and the Council have much pleasure in recording the names of those who have so liberally come forward to assist in promoting this object:—

Francis Bennoch, Esq.	£10	10
Rev. Dr. Booth, F.R.S.	10	10
William Brown, Esq., M.P.	10	0
Thomas De la Rue, Esq.	10	10
Warren De la Rue, Esq., F.R.S.	10	10
C. Wentworth Dilke, Esq.	10	10
J. W. Gilbart, Esq., F.R.S.	10	10
Peter Graham, Esq.	10	10
Henry Johnson, Esq.	90	0
J. Bennet Lawes, Esq., F.R.S.	10	10
Harvey Lewis, Esq.	10	10
The Master of the Mint	10	10
Thomas Martin, Esq.	5	5
J. J. Mechi, Esq., Sheriff of London	10	10
Samuel Morley, Esq.	10	0
General Sir Charles Pasley, K.C.B.	5	0
Sir John William Ramsden, Bart., M.P.	105	0
Titus Salt, Esq.	10	0
R. Stephenson, Esq., M.P., F.R.S.	10	10
Col. Sykes, M.P., F.R.S., Chairman of the Council	10	10
Charles Wye Williams, Esq.	10	10
G. Fergusson Wilson, Esq., F.R.S.	10	10

In addition to these sums the Council has set apart a sum of one hundred guineas from the funds of the Society for the same purpose.

The Marquis of Lansdowne has commenced the Prize List for next year with a donation of £20.

Rating Bill.

The subject of the amending the law relating to the exemption of Scientific and Literary Societies and Mechanics' Institutions from local rates, has again been under the consideration of the Council. The Bill prepared by the Society's Committee, and introduced last year into the House of Commons, did not pass into a law owing to the early period at which Parliament adjourned, though the Bill, after meeting with some opposition, obtained the general approval of the House of Commons. The Bill, amended to suit the views expressed in Parliament last year, has been again introduced into the present Parliament, under the charge of Mr. Hutt, Lord Stanley, and Mr. Ewart, three of the Vice-Presidents of the Society; it has been read a second time, and will be discussed in Committee on the 24th instant.

Evening Meetings.

The Council point with much satisfaction to the Evening Meetings of the past Session, both with regard to the importance and gravity of the subjects brought before them, as well as the character of the papers in which they have been discussed. Where the merits of all have been so great it has been a matter of some difficulty and delicacy to select those to whom medals should be awarded. The Council have awarded them as follows:—

To Mr. Christopher Binks, for his papers "On some New Methods of Treating Linseed Oils and other Drying Oils, for improving their Drying Properties in their Application to Paints and Varnishes," and "On some Combinations and Phenomena that occur among the Elements engaged in the Manufacture of Iron, and in the Conversion of Iron into Steel."—*The Society's Silver Medal.*

To Mr. Robert Temple, (Chief Justice of British Honduras) for his paper "On British Honduras, its History, Trade, and Natural Resources."—*The Society's Silver Medal.*

To Mr. Edward G. Squier, (United States of America) for his paper "On Central America, and the proposed Honduras Interoceanic Railway."—*The Society's Silver Medal.*

To Mr. F. Bashford, (of Surdah, East Indies) for his paper "On Experiments with Silkworms, with a view to Improve the present Silk Yieldings in Bengal."—*The Society's Silver Medal.*

To Mr. J. B. Smith, M.P., for his paper "On the Means to be Adopted for Obtaining Increased Supplies of Cotton."—*The Society's Silver Medal.*

In making the foregoing awards to the authors above named, the Council desire it to be understood that they are not insensible to the great merits of the papers read by the other gentlemen who have favoured the Society. Among them will be found names so well-known, as to render any recognition of their merits by this Society needless. To them—indeed to all—the thanks of the Society are eminently due.

The papers read by Mr. Bennoch and Mr. Winkworth, members of the Council, are expressly excluded from consideration in reference to medals.

Medals and Rewards.

A practice of more than one hundred years has sanctioned the custom of giving medals for ingenious inventions, and for the introduction into this country from our Colonies of new products. The Council this year award a medal as follows:—

To Major H. B. Sears, (United States of America,) for his "Invention of the Nautilus Diving Machine."—*The Society's Silver Medal.*

Special Prizes and Donations.

Whilst on this subject the Council desire to bring to the notice of the Society the following most liberal donations on the part of three of its members. Mr. Henry Johnson has placed at the disposal of the Council two hundred guineas, as a prize for "The best Essay on the present financial position of the country as affected by recent events, in which the principle of a sinking fund should be discussed, and also an investigation made as to the best mode of gradually liquidating the National Debt."*

Sir W. C. Trevelyan, Bart., has placed in the hands of the Council two prizes of £50 and £20, to be respectively awarded for "The two best and approved Essays on the applications of the Marine Algæ and their products, as food or medicine for man and domestic animals; competitors to give the results of their original investigations on sea-weeds (especially on the chemistry of their nutrient principles); and to prepare a series of specimens illustrative of the best modes of collecting, preserving, and preparing the nutritive species in a state fit for food. Mere compilations cannot be admitted to competition."†

Mr. Benjamin Oliveira has renewed his offer of £25, and places it again at the disposal of the Council, as a prize for the promotion of improvements in the arts, manufactures and commerce of the country. The conditions relating to the two first prizes will be found below. The determination of the object, for which Mr. Oliveira's donation shall be offered, will form one of the first duties of the new Council.

THE COLONIAL UNION.

This Union now consists of 12 Colonial Institutions, and the Council have had under its consideration a proposition for further developing the usefulness of the Society in this direction, where it is believed there is much that the Society may do with great benefit to the interests both of the colonists as well as the home importers. This subject opens up the larger question of extending the Commercial and Manufacturing relations of the Society. What may be the precise mode which should be adopted has yet to be determined, whether, as regards India and our Colonies, by the means suggested in Mr. Hyde Clarke's letter, published in the *Journal**, or whether, by taking a wider view of the subject, the usefulness of the Society and the interest of its proceedings may not be greatly extended by selecting from among the members those specially qualified who may be willing to undertake the duties of bringing before the Society and the public at the Evening meetings, or in the *Journal*, or otherwise, such matters relating to Manufactures, Commerce, or our own Colonies, as may specially require attention at the time. Standing Committees might be formed as occasion arose, to take charge of those subjects, placing on them such of our members as might be willing to give their attention in those special directions, such Committees to have honorary secretaries for conducting their business. It is suggested and it is known that there are many among the members who would willingly undertake these duties, and, by the Society thus working in sections, the powerful influence of the whole body might, from time to time, be brought to bear in such directions as the circumstances of the day rendered most desirable. The *Journal* would aid materially in promoting these views. These are suggestions which will come before the Committee to whom Mr. Hyde Clarke's propositions have been referred, and with which the new Council will have to deal.

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* CONDITIONS.

1. The Essays to be sent to the Society of Arts by the 31st day of December, 1857. Each Essay to be marked "Finance Essay," and to have a motto or distinctive mark attached, which mark must also be written on a sealed letter, containing the name and address of the author.

2. The Essay will be delivered by the Council of the Society to the adjudicators, who will fix a day for making their award, which will be more or less distant, according to the number and size of the Essays.

3 The letters, containing the names and addresses of the authors, will remain with the Society of Arts, and none will be opened except that bearing the motto, or mark attached to the Essay to which the adjudicators award the Prize.

4. The adjudicators shall not be expected to give any reason for their award, beyond stating that in their judgment the Essay is the best that has been submitted to them upon the subject, and is worthy of the Prize, nor shall they be expected to give any opinion as to the soundness of any sentiments or theories which the Essay may contain.

5. When the adjudicators are prepared to make their award, a special meeting of the Council shall be summoned, and the Chairman shall then open the letter which bears the motto or mark attached to the successful Essay, and the Secretary will then communicate with the author.

6. That in case the author of the successful Essay shall be unwilling to print and publish the Essay at his own expense, then the copyright shall belong to the Council of the Society of Arts, who may publish the whole or any part of it, as they may think proper.

7. That the unsuccessful Essays shall be returned to their authors when claimed, with the seals of the letters unbroken

8. That the number of the adjudicators to be appointed by the Council be three.

9. The Council reserve to themselves the right of withholding the prize entirely, in the event of the adjudicators reporting that in their judgment no Essay sent in is deserving of the reward.

*** Each Essay must be written in a plain legible hand, and only on one side of the paper, and it is recommended that it be as brief as is consistent with the importance of the subject.

† CONDITIONS.

1. The Essays, with accompanying specimens, to be sent to the Society of Arts by the 31st day of March, 1858. Each Essay to be marked "Essay on Marine Algæ," and to have a motto or distinctive mark attached, which mark must also be written on a sealed letter, containing the name and address of the author.

2. The Essays will be delivered by the Council of the Society to the ajudicators, who will fix a day for making their award, which will be more or less distant, according to the number and size of the Essays.

3. The letters containing the names and addresses of the authors will remain with the Society of Arts, and none will be opened except these bearing the mottoes or marks attached to the Essays to which the adjudicators award the Prizes.

4. The adjudicators shall not be expected to give any reasons for their award, beyond stating that in their judgment the Essays are the best that have been submitted to them upon the subject, and are worthy of the Prizes, nor shall they be expected to give any opinion as to the soundness of any sentiments or theories which the Essays may contain.

5. When the ajudicators are prepared to make their award, a special meeting of the Council shall be summoned, and the Chairman shall then open the letters which bear the mottoes or marks attached to the successful Essays, and the Secretary will then communicate with the authors.

6. That in case the authors of the successful Essays shall be unwilling to print and publish the Essays at their own expense, then the copyright shall belong to the Council of the Society of Arts, who may publish the whole or any part of them, as they may think proper.

7. That the specimens accompanying the successful Essays shall be the property of the Society of Arts.

8. That the unsuccessful Essays, with the accompanying specimens, shall be returned to their authors when claimed, with the seals of the letters unbroken.

9. That the number of the adjudicators to be appointed by the Council be not less than five.

10. The Council reserve to themselves the right of withholding the prize entirely, in the event of the adjudicators reporting that in their judgment no Essay sent in is deserving of the reward.

*** Each Essay must be written in a plain legible hand, and only on one side of the paper, and it is recommended that it be as brief as is consistent with the importance of the subject.

* *Journal of the Society of Arts*, vol. v., p. 373.

Museums.

The Trade Museum, which in the last report of the Council was referred to as having been transferred to the Royal Commissioners for the Great Exhibition of 1851, on repayment to the Society of the money which had been expended on it out of the Society's funds, has been handed over during the past year, to the Royal Commissioners, who have paid over to the Treasurers the amount agreed upon, and the Collection will be displayed at the New Museums erected by the Government at South Kensington. Here also will be shown the Educational Museum, which has been founded on the basis of the Society's Educational Exhibition, and the nucleus of which was placed by the Society in the hands of the Government for that purpose. The Economic Museum which has been referred to in previous reports, has also, within the last few months, been transferred to the Kensington Museums for display, the Government having taken it under their own charge at the request of the Society. To Mr. Thomas Twining, jun., one of the Society's Vice-Presidents, belongs the great merit of bringing this matter before the public, and commencing the collection within the Society's walls, and ultimately inducing the Government to establish it as a National Institution. The Council have endeavoured to aid Mr. Twining in this undertaking, though through that gentleman's liberality in providing the funds necessary for the purpose, the Society has been at no expense whatever in the matter.

The Kensington Museums were formally opened by her Majesty, on Saturday last, after which they will be thrown open to the public for inspection generally. The Council congratulate the members on the realization of these objects, for which the Society has so long laboured.

Brussels Congresses.

Deputations from the Society attended these Congresses during the autumn of last year. Mr. Twining's report on the Economic Exhibition in connection with the Congrès de Bienfaisance has been printed in the *Journal*;* and Mr. Winkworth read a paper at one of the evening meetings of the Society, with reference to the proceedings and results of the Free Trade Congress.†

Repairs and Alterations.

During the past year, in conformity with the obligation of the Society's lease, the Council have expended a considerable sum, as will be seen by the financial statement annexed to this report, on the necessary repairs and painting of the Society's House, and the re-decorating and lighting the Society's Meeting room. The Council have also fitted up, and placed at the disposal of the members, the lower rooms of the Society, for a reading-room and for writing.

Conversazioni.

Two Conversazioni have been held during the Session, the first of which was attended by ladies, the second by gentlemen only. At both these gatherings of the members of the Society and their friends, the rooms were inconveniently crowded, plainly indicating that the Society has out-grown its habitation, and that no time must be lost in looking out for suitable accommodation for carrying on its greatly extended operations.

Publications of the Commissioners of Patents.

During the Session the Commissioners of Patents have presented to the Library of the Society a complete series of all their publications, in all about 600 volumes, upon the condition that the public have access to them for consultation, free of charge, at all reasonable office hours. To this condition the Council have acceded, and the volumes, as soon as they can be bound, will be placed on shelves ready for the use of the members and accessible to the public. These publications, it is almost needless to say, contain information of the highest importance to all engaged in promoting the progress of Arts, Manufactures, and Commerce.

Finance.

In submitting the Balance Sheet the Council congratulate the Society on the steady progress which has been made during the past year. On a comparison of the Balance Sheet of 1856 with that of the present year, it will be seen that the Society's income has been, in 1857, £4,471 14s. 5d. as against £4,173 17s. 11d. in 1856. The expenditure for the same period has, however, been considerably in excess of the year of 1856; but this is due to the fact, that a portion of the £760 paid off the debenture debt has been paid out of ordinary income—in addition to £50 of the old loan not bearing interest which has been repaid, and that £426 13s. 1d. has been expended in repairs and alterations, which have tended materially to the comfort and convenience of the members. Owing, also, to the periods at which the examinations have been held, a very large proportion of the cost of two examinations has fallen on the present year.

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* *Journal of the Society of Arts*, vol. iv., p. 780.

† *Ibid.* vol. v., p. 391.

The total liabilities of the Society are now £1,275 8s. 9d., as compared with £1,615 14s. 5d. in 1856, while the cash in hand and subscriptions outstanding are—

	£	s.	d.
Cash	464	1	2
Subscriptions due	986	11	8
	1,450	12	10

or £175 4s. 1d. in excess of the total claims upon the Society, leaving the entire of the Society's funded property and other property without a claim upon it. This is a position which no Council of this Society has ever before been able to bring before the members.

The Secretary then read the Treasurers' Statement of the Receipts, Payments, and Expenditure during the past year, which was published in the last number of the Journal, page 439.

General Sir Charles Pasley, K.C.B., moved the adoption of the report, which was seconded by Mr. William Smith.

The Chairman then put the motion to the meeting, when the report was unanimously adopted.

The ballot having remained open one hour, and the scrutineers having reported, the Chairman declared that the following noblemen and gentlemen had been elected to fill the several offices. The names in *italics* are those of members who have not, during the past year, filled the offices to which they have been elected.

COUNCIL.

PRESIDENT.

H.R.H. Prince Albert, F.R.S., &c., &c.

VICE-PRESIDENTS.

Lord Ashburton.
William Brown, M.P.
Harry Chester.
Henry Cole, C.B.
C. Wentworth Dilke.
William Ewart, M.P.
Joseph Glynn, F.R.S.
The Earl Granville, F.R.S.
William Hutt, M.P.
Marquis of Lansdowne.
George Moffatt, M.P.
The Right Hon. Sir John Pakington, Bart., M.P.
Sir Joseph Paxton, M.P.
Dr. Lyon Playfair, C.B. F.R.S.
John Scott Russell, F.R.S.
Lord Stanley, M.P.
R. Stephenson, M.P., F.R.S.
William Tooke, F.R.S.
Thomas Twining, jun.
Thomas Winkworth.

OTHER MEMBERS OF COUNCIL.

Francis Bennoch.
Rev. Dr. Booth, F.R.S.
William Fairbairn, F.R.S.
J. Griffith Frith.
James Glaisher, F.R.S.
Peter Graham.
Thomas Graham, F.R.S.
Matthew Marshall.
Edward Solly, F.R.S.
Dr. Stenhouse, F.R.S.
Colonel Sykes, M.P., F.R.S.
George Fergusson Wilson, F.R.S.

TREASURERS.

J. W. Gilbart, F.R.S.
J. C. Macdonald.

AUDITORS.

J. G. Appold, F.R.S.
William Mackrell.

SECRETARY.

Peter Le Neve Foster, M.A.

FINANCIAL OFFICER.

Samuel Thomas Davenport.

At this meeting, in conformity with the provisions of the Act of Parliament, 3 William IV., c. 4, intituled "An Act for Settling and Preserving Sir *John Soane's* Museum, Library, and Works of Art in *Lincoln's Inn Fields*, in the County of *Middlesex*, for the Benefit of the Public and for Establishing a sufficient Endowment for the due maintenance of the same," Charles Wentworth Dilke, Esq., jun., was duly elected the Society's Trustee of the Soane Museum, in the place of his Royal Highness Prince Albert, whose term of office under the Act had expired.

Home Correspondence.

MR. BINKS'S PAPER ON IRON AND STEEL.

Sir,—I have had great pleasure in perusing Mr. Binks's very able paper read before the members on the 27th ulto., and had hoped that some of the veteran steel makers of Sheffield would have expressed their views on the subject. In this hope I am disappointed.

The fact Mr. Binks appears desirous to establish is, that steel cannot be made with carbon alone, but that a given per-centage of nitrogen must also be present. Will you allow me to inform Mr. Binks that for a period of above nine years I have manufactured cast steel direct from the malleable iron (dispensing altogether with the cementing process), and for a portion of that time used nothing but carbon, and never once failed in producing a good marketable steel. That nitrogen improves steel, I am bound to admit, but that it is an essential element, a long experience denies. About five years ago, I adopted the use of a nitrogenous flux, which has considerably improved the quality of the steel, giving it a tenacity it does not possess when made with carbon alone.

I am not surprised that Mr. Sanderson should refuse to admit decarbonised cast or pig iron into the category of malleable iron or steel; the refining and puddling furnaces do more than remove excess of carbon, they remove a portion of the earthy bases and metalloids, and bring the iron into a comparatively pure state.

Perhaps it would interest your experimental readers to know what I have done with iron and steel by way of experiment.

In 1848, I made cast-steel direct from foreign and British ores; the results were a metal that would draw into bars, but these had no commercial value.

In November, 1851, I succeeded in reducing malleable iron to a perfectly fluid state, removing, with the aid of fluxes, the whole of the earthy bases and nearly the whole of the metalloids; I thus brought the mass into a more homogeneous state than any other metal known in the market. It has stood the test of the die cutters' graver and the etcher's acids for five and-a-half years, and has almost entirely displaced cast-steel for calico engravers' dies in this country, and to some extent in America. So entirely have I obtained the control over iron, that, from a ductility very near copper, I can advance by almost imperceptible degrees of hardness to steel; thence through the various tempers of steel to semi-steel; thence to cast iron; the purity of the metal to correspond with the degree of carbonisation, or when desired the impurities can be removed and the carbon retained.

In July, 1855, I made iron and steel from tin clippings, after the tin had been removed. The steel made from these clippings would carry an edge and cut, but would not stand much fatigue; the iron was very brittle and quite useless. The intense heat necessary to bring it to a liquid state destroyed the base of the iron. In November, 1855, I tried the plan lately proposed by Captain Uchatius, of fusing together certain proportions of wrought and cast iron. This produced but an indifferent steel, far from being homogeneous, and it was of a low commercial value; these and other experiments have led me to the conclusion that for a first class steel, or a first class pure iron, we must use the best Swedish iron.

Allow me one word to Mr. Mushet on the boiling process. He states, "one remarkable feature disclosed by it" (the boiling process) "is, that very intense heat does not necessarily, as hitherto supposed, impair the quality of iron, that it is the hitherto imperfect methods of applying the heat whence this impression has been derived, depriving the puddler of the most valuable agent for purifying." So long as there are earthy bases in quantity present with the metal, to protect the iron from the action of the fire, this remark applies with force, but as the iron approaches purity this protection is lost, and the fire acting upon the iron destroys it. Our British irons have not the body to withstand the heat necessary to flux out the whole of the earthy bases. I have kept cast-iron in an air-excluding crucible for nine hours, at a most intense white heat, without injury to the metal. British malleable iron, kept in the same state for five hours, became brittle and useless.

I cannot conclude without expressing my conviction that, although Mr. Bessemer's experiments have commercially failed, that gentleman is entitled to the best thanks of the iron producers and consumers of this country, for he has raised such a spirit of inquiry throughout the length and breadth of the land, as must lead to an improved system of manufacture. No longer ago than Tuesday last, when conversing on the manufacture of iron with an ironmaster near Glasgow, he said, "would you believe it, sir, before Bessemer's fuss, I never considered it worth while to inquire into the chemical composition of iron, or try to get out of the jog-trot course my father pursued; since then I have read and studied all the published works on the manufacture of iron, and although I cannot say I have improved the make, still I have the satisfaction of knowing I am working on correct principles, and if anything goes wrong, I shall not be in the dark as to what it is."

Should any of your town readers wish to see samples of the pure iron and semi-steel I have named, they can be seen any day at the office of the Inland Oriental Steam Co., 9, Billiter-street. I am, &c.,

W. HAWKSWORTH.

Avon Steel and Iron Works, near
Linlithgow, June 17, 1857.

Proceedings of Institutions.

Blackburn.—The fourteenth annual report of the Literary, Scientific, and Mechanics' Institution shows that the progress so far made by the Institution is such as to justify favourable anticipations as to its future increasing usefulness and utility. The number of members at the close of the year ending March 31st, 1857, was 479, showing a moderate increase since last year. The attendance during the year at the classes has fluctuated considerably, the summer quarters especially showing a large and almost inevitable diminution. On the whole, the attendance, as compared with the preceding year, is rather below the average. The following lectures have been delivered during the last year, viz:—Mr. H. W. May, L.C.P., "Elocutionary Entertainment." Rev. A. Fraser, M.A., "The Human Mind and its Powers." Rev. J. V. Meany, "Architecture." Mr. J. J. Myres, "Atmospheric Air and its Mechanical Properties, with Experiments in illustration." Mr. Josiah Singleton, "On Reading, with Illustrations from various Authors." Rev. C. Robinson, LL.D., "Home Comforts for Working People." Rev. M. Macfie, "Popular Delusions." Mr. Isaac Lloyd, "The Love and Study of Nature. Rev. F. Skinner, M.A., "Physiology applied to Health and Education, shewing how to have a sound mind in a sound body." Mr. Baynes, "The Cotton Trade." (1st Lec.) Rev. E. D. Rendell, "The Influence of the Fine Arts—Music and Poetry." During the year 355 volumes have been added to the library, 335 volumes by purchase, and the remainder by presentation, making the total number 2,862. The number of volumes issued this year is 10,733, against 6,124 issued last year. Volumes in the library now, 2,862. The unprecedented demand for books affords proof of the necessity for the much needed augmentation the directors were enabled to make in 1855; with the comparatively limited number of books as yet in stock, the directors again begin to feel the difficulty of sustaining the continued active demand,—they therefore earnestly desire to impress on the minds of all supporters of the Institution the growing necessity arising for funds, to enable them to further extend the usefulness of this department. The following gentlemen form the Board of Management for the ensuing year, viz:—*President*, Joseph Fielden, Esq.; *Vice-Presidents*, James Pilkington, Esq., M.P., Wm. Hy. Hornby, Esq., M.P., Major Feilden, and Robert Hopwood, Esqs.; *Directors*, Messrs. Miles Baron, John Bell, James Booth, Ellis Duckworth, John Garstang, H. F. Jopson, John Margerison, R. C. Radcliffe, Thomas Ratcliff, Jas. B. Stones, John Robinson, and Robert Davies as representative of the Engineers' Class; *Hon. Secretaries*, Messrs. R. H. Hutchinson and T. Ainsworth, Jun.

Dumfries.—A work, entitled "The Dumfries Album," has been lately published, under the auspices of the Mechanics' Institution, and the profits are to be devoted as a contribution to the fund now being raised for building a lecture-hall. The "Album" is a handsomely-printed volume, edited by Dr. A. Mercer Adam.

Newport.—The sixteenth annual report of the Athenæum and Mechanics' Institute congratulates the members upon the gratifying position which the Institution now holds. During its sixteen years' existence, it has experienced many vicissitudes; but the year now ending may be regarded as one of the most eventful, and, at the same time, one of the brightest in its history. In nearly every department there has been a marked improvement, and the Committee are of opinion that the maximum has not yet been attained. They attribute the gratifying success of the past year to the zeal and efficiency of the secretaries, and of those gentlemen who have so kindly obtained additional subscribers; and the fact of a kindred institution in the neighbourhood, having a large number of members, not having affected the prosperity of the Athenæum, leads the committee to believe that it is now looked upon (and they think deservedly) as a great and powerful instrument of moral and intellectual good. At the commencement of the present year the Institution was burdened with a heavy debt. This, the Committee, by the exercise of the strictest economy (and also by the zealous exertions of the gentlemen before referred to) have not only been enabled to remove, but they have also made a large addition to the library, besides having a balance of £15 18s. 3d. in hand—results obtained entirely from the ordinary receipts of the Institution. The committee have received notice from the Town Council to quit the rooms which they have so long occupied in the Town-hall, and they hope they may be enabled to procure more suitable premises, as the present reading-room affords very inadequate accommodation for the increased number of members. The increase in the number of members has been considerable. The number at present enrolled is 538—being an increase of 203 over the corresponding period of last year, and an increase of 23 over the highest number ever previously belonging to the Institution. The library now contains 2,383 volumes. The number circulated during the past year has been about 10,000, being a considerable advance upon last year. The following lectures and entertainments have been given during the year:—Mr. R. Fitzgerald, "Two Humorous Entertainments;" Mr. J. Snary, jun., and party, "Musical Entertainment;" Mr. Geo. Grossmith, "The Ludicrous in Life;" Mr. Edward Thomas, "Festus;" Mr. J. K. Applebee, "The Life, Times, and Works of John Bunyan;" Mr. J. K. Applebee, "Thomas Hood—Poet and Punster;" Mr. Geo. Melville, "Dickens's Christmas Carol;" The Rev. F. Pollard, "Milton's Prose Works:" Mr. Ellis Roberts and Mrs. Winn, "Minstrelsy, illustrated by Harp and Voice;" Mr. Geo. Dawson, "Hamlet;" Mr. Geo. Grossmith, "Nicholas Nickleby;" Mr. Geo. Grossmith, "Humorous Characteristics;" Mr. J. K. Applebee, "The Writings of Douglas Jerrold;" Mr. J. K. Applebee, "The Educational Movements of the Age." The committee have paid in fees to lecturers, £47 17s. 6d., and have much pleasure in reporting that the lectures have invariably been well attended, and the funds of the Institute materially benefited thereby. The committee have the greater pleasure in stating this fact, inasmuch as, for the past few years, lectures have generally been a source of loss to the Institute. The total attendance at 15 lectures has amounted to 2,928, giving an average of 188. The committee conclude their report by introducing a marked acknowledgment of the highly valuable services of the retiring secretaries. While not overlooking the exertions of former secretaries, the committee feel that the gentlemen about retiring are entitled to the gratitude of the Institution, not only for having taken office at a period of almost unprecedented depression in its affairs, but for having zealously and perseveringly applied their energies to the interests of the Athenæum in a manner which has resulted in rescuing it from pecuniary embarrassment and placing it in a position of more than ordinary prosperity. The following gentlemen have been elected officers for the present year:—*President*—Sir Thomas Phillips; *Vice-Presidents*—Rev. E. Hawkins, M.A.; Mr. Wm. Christophers, Mr. R. G. Cullum, Mr. Thomas Jones; *Honorary Secretary*—Mr. John Wood; *Librarians*—Mr. William Wade, Mr. W. Thorne Jones, Mr. Edward Lewis, Mr. Thomas Fox; *Treasurers*—The West of England and South Wales District Bank; *Auditors*—Mr. John Cole, Mr. S. M. Phillips; *Committee*—Mr. Benjamin Taylor, Mr. J. F. Thomas, Mr. George Jones, Mr. John Warren, Mr. John Johns, Mr. B. L. Brown, Mr. Charles Ryan, Mr. John Adlam, Mr. H. J. Cullum, Mr. Charles Rowe, Mr. John Mason, Mr. John Evans.

MEETINGS FOR THE ENSUING WEEK.

MON. United Service Institution, 8½. Mr. Montague Gore, "On the System of Instruction pursued in the French Regimental Schools."
THURS. Zoological, 3.
FRI. United Service Institution, 3. Lieut.-Col. McDougall, "The Genius and Campaigns of Hannibal."
SAT. Asiatic, 2.

PARLIAMENTARY REPORTS.

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SESSIONAL PRINTED PAPERS.

PAR. No.

Delivered on June 13th and 15th.

97. Cape of Good Hope—Correspondence.
79. Army, &c.—Returns.
86. St. James's Park—Return.
89. Court of Chancery (Ireland)—Accounts.
91. Slave Trade (Cuba)—Return.
38. Bankruptcy (Ireland)—Return.
52. Bills—Ecclesiastical Commission.
59. ——— Vaccination.
60. ——— Turnpike Trusts Arrangements.
Statute Law Commission—Third Report.

Delivered on June 16th.

38 (1). Civil Services, Estimates—Class I. (A corrected copy).
76. Coals, Cinders, and Culm, &c.—Account.
77 (A). Poor Rates and Pauperism—Return (A).
93 Marine Insurances—Return.
40. Bills—Burial Acts Amendment (amended).
56. ——— Highways.
Statute Law Commission—Appendix to Third Report.

Delivered on June 17th.

China—Papers relating to the Opium Trade.
China—Correspondence between the Foreign Office and the Commercial Association of Manchester.

FIRST SESSION, 1857.

151. Arterial Drainage (Ireland)—Return.

Delivered on June 18.

92. Wine and Spirits—Account.
94. Silk—Return.
103. Licensed Passenger Brokers (Port of Liverpool)—Return.
61. Bills—Fraudulent Trustees, &c. (amended).
63. ——— Insurance of Lives (Abatement of Income-tax) Continuance.
66. ——— Wills, &c., of British Subjects Abroad.
Poor Laws (Ireland)—10th Annual Report.

Delivered on June 19th.

86. St. James's Park—Return (a corrected Copy).
38 (6). Civil Services—Estimates, Class 6.
108. Westminster New Palace—Return.
62. Bill—Savings Banks (No. 2) (amended).

Delivered on June 20th and 22nd.

96. Treasury Chest—Account.
101. Hong Kong—Correspondence.
104. Hudson's Bay Company—Copy of Letter.
83. East India—Return.
115. Hong Kong—Correspondence.
99. Seamen's Money Orders—Return.
106. Marriages—Return.
2. Harbour, &c., Bills—Board of Trade Report; (23), Pulteney Town Harbour.
67. Bills—Registration of Long Leases (Scotland) (amended).
70. ——— Sites for Workhouses.

Delivered on June 23rd.

92. Wine and Spirits—Account (a corrected Copy).
112. East India (Tenures of Land)—Return.

Delivered on June 24th.

105. British Museum—Account and Estimate.
111. Pauper Lunatics (Marylebone)—Return.
121. Board of Health—Return.
64. Bills—Leases and Sales of Settled States.
65. ——— Election Petitions.

PATENT LAW AMENDMENT ACT.

APPLICATIONS FOR PATENTS AND PROTECTION ALLOWED.

[*From Gazette, June* 19.]

Dated 21st March, 1857.

804. Bewicke Blackburn, Clapham-common—Improvements in the manufacture of pens.

Dated 23rd April, 1857.

1156. John Thomas Way, Welbeck-street—An improvement in the manufacture of soap.

Dated 5th May, 1857.

1264. Juste Herrero, 53, Rue Vivienne, Paris—An improved inking and stamping machine.

Dated 7th May, 1857.

1292. William Charles Aberdein, 16, Shepperton-cottages, New North-road, Islington—The tubular elastic fastener and stud for gentlemen's shirt collars and wristbands, and other garments.

Dated 8th May, 1857.

1302. Caleb Tayler, Deptford, Kent—Improvements in the manufacture of sheets of material suitable for covering floors, and for other useful purposes.

Dated 27th May, 1857.

1499. Randal Cresswell, Conduit-street—A new article, to be called "typha velvet," suitable for carpets, furniture hangings, wearing apparel, and other useful purposes.
1506. Thomas Grahame, Upper Seymour-street, Portman-square—Improvements in inland navigation.

Dated 30th May, 1857.

1523. Louis Heinemann and Arnold Heinemann, Manchester—Improvements in those parts of printing machines called "doctors."
1537. Thomas Wilson, Bradmore-house, Chiswick—Improvements in floating bodies used in washing machines.

Dated 3rd June, 1857.

1557. Peter Rothwell Arrowsmith and Robert Caunce, Bolton-le-Moors—Certain improvements in machinery for carding cotton and other fibrous materials.
1558. Paul Emile Chappuis, Fleet-street—Improvements in stereoscopes.
1559. Edmond Roy, 36, Rue de l'Echiquier, Paris—Improvements in the construction of railway vehicles for the special purpose of allowing them to run freely on short curved lines.

1560. Charles Robertson, London—An apparatus for cleaning the bottoms of iron ships while afloat.
1561. Samuel Lees, James Lees, and Frederick Lees, Rochdale—Improvements in machinery for warping cotton, worsted, and other fibrous substances.
1562. William Jones, Kelvey-cottage, Swansea—Improvements in heating and compressing artificial fuel.
1563. Samuel Morand, Manchester—Improvements in apparatus used for stretching and drying fabrics.
1564. George Remington, Hereford-square, Old Brompton, and John Barton Balcombe, Sutherland terrace, Loughborough-park, Brixton—Improvements in locomotive engines, applicablo to common roads.
1565. George Deeley, West Bromwich, Stafford—Improved means for preventing the explosion of steam boilers.
1566. Richard Archibald Brooman, 166, Fleet-street—Improvements in gas burners (A communication.)
1567. John Jobson, Bulwark-street, Dover—Improvements in oil cans or feeders.
1568. William Barr, 15, Panton-street, Haymarket—Improvements in actual measurement for "delineating garments." (A communication.)

Dated 4th June, 1857.

1569. Laurent Prosper Therrin, 5, Grand Rue, Dieppe, Seine Inférieure, France—Improvements in railway breaks, applicable to railway carriages, called railway lever breaks.
1570. Henry Constantine Jennings, 8, Great Tower-street—Improvements in the manufacture of paper, papier maché, and other similar substances.
1572. Victor Blumberg, Bloomfield-lodge, Notting-hill—Improvements in the manufacture of billiard tables.
1573. William Miller, 15, Buckingham street, Strand—Improvements in the manufacture of sugar, and in the apparatus used therein.
1574. William Harding, Forest hill—An improvement in pistol holsters.
1575. Thomas Welcome Roys, Southampton, Long Island, New York—Improvements applicable to fire-arms.
1576. James King, Observatory-street, Oxford—Improvements in the manufacture of shirts.
1577. Thomas Latham Boote and Richard Boote, Burslem, Stafford—Improvements in the manufacture of ornamental pottery and articles made from clay and other plastic materials.

Dated 5th June, 1857.

1578. Robert Hanham Collyer, M.D., 3, Park-road, Regent's-park—An improved mode of preparing the residue of beetroot, mangold-wurtzel, and other species of the genus beta left in sugar making and distillation, to be used as material in making paper, papier maché, millboard, and other similar manufactures.
1579. Richard Roberts, Heaton Norris, Lancashire, and Wright Shaw and Samuel Shaw, Geecross, Cheshire—Improvements in machinery for weaving and folding fabrics.
1580. Edouard Roussille, Jurançon, near Pau, France—Improvements in manufacturing stearic acid.
1581. Joseph Etienne Marie Jean Clair, Annonay, France—Certain improvements in propelling on water and in the air. (A communication.)
1582. Thomas Wheelhouse, Salford, and John Greenwood, Pendleton—Improvements in ventilating vehicles or carriages in motion.
1583. Henry Schmidt, 34, Surrey-street, Strand—The new cork roller for lithographic printing. (A communication.)
1584. George Collier, Halifax—Improvements in preparing printed or parti-coloured yarns for manufacture into fabrics.
1585. Ferdinand Jossa, St. Helen's Colliery, near Bishops Auckland, Durham—Improvements in uniting iron and steel.
1587. William Edward Newton, 66, Chancery-lane—Improvements in the manufacture of paper, papier maché, cardboard, and other similar articles. (A communication.)
1589. Edmund Knowles Muspratt, Liverpool, and Balthasar Wilhelm Gerland, 46, Lloyd street, Greenheys, Manchester—Improvements in treating waste liquors produced in the manufacture of chlorine, and in separating nickel, cobalt, and copper, from liquors containing them in combination with manganese and iron.

Dated 6th June, 1857.

1590. Thomas George Shaw, Dartmouth-row, Blackheath—Improvements in bedsteads. (A communication.)
1591. Frederick Oldfield Ward, Cork-street, Burlington-gardens, and Frederick Wynauts, Rue de la Paix, Ixelles-lez Bruxelles—Improvements in manufacturing manure and obtaining accessory products.
1592. Hiram Powers, Florence—An improved machine for punching, stamping, or cutting metals and other substances.
1593. Rudolph Dinglinger, Berlin—Improvements in pumps, which improvements are also applicable to steam engines.
1594. Edward Hirst Hudson, Burley, Yorkshire—Improvements in means or apparatus to prevent driving straps lapping on the shafting when they shift off their pullies.
1595. Henri Joseph Noé, Paris—Improvements in portable stereoscopes.
1596. Joseph Rogers, Bartholomew-close—Improvements in machinery for winding or folding drapery and other like goods.
1597. Edward Edwards, Englefield-terrace, De Beauvoir-town, Kingsland—An improved mode of fastening stair rods and other rods.
1598. Amory Fairbanks Sherman, Roxbury, Massachusetts, U S.—Improvements in machinery for breaking, hatchelling, roving, spinning, and tarring hemp, flax, manilla, or any fibrous material or materials.
1599. Alfred Jean Vincent Dopter, Paris—Improvements in ornamenting cloth, wood, metal, leather, and other surfaces.

Dated 8th June, 1857.

1601. Donald Bethune, Cambridge-terrace, Hyde-park—Improvements in apparatus for preventing or consuming smoke in furnaces and chimnies.
1602. John Brown, Golds Green, West Bromwich, Staffordshire—Certain improvements adapted to the prevention of steam-boiler explosions.
1603. Edgar Brooks, Birmingham—A new or improved manufacture of gun barrels, and other articles of like manufacture.

Invention with complete Specification Filed.

1658. Thomas Turner, Wolverhampton—Improvements in apparatus to be employed as an alarm, and detector in cases of burglary.—12th June, 1857.

WEEKLY LIST OF PATENTS SEALED.

June 19th.

3010. James Penny and John Booth.
3017. Edward Loos.
3034. William Beckett Johnson.
3036. Frederic Prince.
3049. Alfred Heather.
3054. William Taylor.
3057. Rd Archibald Brooman.
3064. Armand Jean Baptiste Louis de Marcescheau.
3070. Henry Horace Goodman.
3089. Timothy Alden.
3090. John James Speed, jun., and John Aylesworth Bailey.
3102. William Bray.
14. Edouard Vincent Jules Laurent Gorges.
30. William Edward Newton.
37. Andrew Brundish.
117. William Edward Newton.
123. Joseph Higham.
127. Alfred Vincent Newton.
155. William Haslett Mitchel.
163. Alfred Vincent Newton.
208. Peter Armand le Comte de Fontainemoreau.
366. James Murdoch.
379. Julian Bernard.
532. Aime Koch.
592. Henry Whatley Tyler.
746. George Farrell Remfry.
776. Thomas Sidebottom Adshead and Abraham Holden.
887. Samuel Jabez Goode.
888. Frank Clarke Hills.
900. John Leslie.
970. Ebenezer Rogers.

June 23rd.

3050. William Mac Naught.
3055. James Samson Barraclough.
3059. Cromwell Fleetwood Varley.
3079. James Petrie and William Mc Naught.
3094. Rd. Archibald Brooman.
2. Charles Christian Reinhardt.
10. Anthony Lorimer.
12. John Fowler, junr.
33. Christopher Binks.
34. Christopher Binks.
43. John Moore Hyde.
136. George Storey Moore.
253. James Lee Norton.
255. James Lee Norton.
715. George Travis.
1051. John Rubery.
1123. John Chanter and David Annan.

Patents on which the Stamp Duty of £50 has been Paid.

June 15th.

1307. Thomas Mara Fell and William Cooke
1313. Frederick John Julyan.
1317. David Lowe.
1325. John Allin Williams.

June 17th.

1321. Joseph Fourdrinier.
1345. Alexander Stephen, junr., and Alexander Pirnie.

June 18th.

1356. John M'Innis.

June 19th.

1347. Nathaniel Clayton and Joseph Shuttleworth.
1371. Charles Cowper.

June 20th.

1359. Oliver Rice Chase.
1369. John Marriott Blashfield.
1399. John Thomson.
1428. Corydon Stillman Sperry.

WEEKLY LIST OF DESIGNS FOR ARTICLES OF UTILITY REGISTERED.

No. in the Register.	Date of Registration.	Title.	Proprietors' Name.	Address.
3996	June 13.	Barlow's Registered Coffee Roaster and Cooking Apparatus	James Barlow	14, King William street, City.
3997	,, 20.	Turnip Hoe	John Eaton	Twywill Works, near Thrapston, Northamptonshire.
3998	,, 23.	Gouging Bit	Sharp, Stewart, and Co., and William Mark Lowe	Manchester.

Journal of the Society of Arts.

FRIDAY, JULY 3, 1857.

MEETING OF COUNCIL.

Wednesday, July 1st, 1857.

The Council held their first meeting this day since their election. The Rev. Dr. Booth, F.R.S., was elected Chairman for the current year.

SOCIETY'S LONDON EXAMINATIONS.

In the list of certificates awarded, given in last week's *Journal*, under the head "Political and Social Economy," a certificate of "Proficiency" in this subject appears opposite the name of W. W. Smith. This certificate belongs to Thomas Mirehouse, of the Royal Polytechnic Institution. This mistake arose from the candidate having affixed a wrong number to his papers.

SWEDISH CALCULATING MACHINE.

A notice of this machine appeared in the *Journal* of the 27th of April, 1855 (Vol. 3, p. 411). "Specimens of tables calculated, stereo moulded," and printed from it, have just been published. It is, therefore, not out of place now to give some further particulars of its history and ultimate disposition. It is unnecessary to point out the manifold practical advantages derived in modern times from the various numerical tables in the hands of scientific explorers. Astronomers, navigators, engineers, actuaries, and others, could have made but little progress had it not been for the resources supplied to them by those men who, with indomitable perseverance and labour, have devoted so many years of their lives to this irksome and herculean task. Where would science and its practical applications have been at this moment but for the labours of Napier, Briggs, and others? Notwithstanding all that has been done to ensure accuracy—and immense labour and care has been bestowed in endeavouring to ensure it—yet much still remains to be done. There is scarcely a numerical table published which does not contain errors more or less numerous. It was a consideration of this important fact that led Mr. Babbage to conceive the project of constructing a machine which, by mechanism alone, should not only compute the tabular numbers, but at the same time impress its results in such a manner that they might be printed immediately on paper, so as to supersede the use of ordinary types. To calculate alone is not sufficient. To read the numbers and transfer them to type is a manifest source of error. To ensure positive certainty the machine must combine the act of mechanical computation with that of simultaneously printing the numbers. This idea of Mr. Babbage, it is believed, is perfectly original. Such was the origin of Mr. Babbage's calculating machine, and its operations were based on the principle of successive additions of several orders of differences derived from any numerical series having all its terms connected by some analytical law. The machine was hence called the "Difference Engine." This machine was, however, from various causes, never completed. There had been, no doubt, a variety of calculating machines previous to that of Mr. Babbage, but they were simply for effecting arithmetical operations of the most elementary kind, such as addition, subtraction, multiplication, and division, the very operations which numerical tables are intended to supersede, by sparing the enquirer the trouble of performing them either by the labour of the head or the manipulations of a machine, and presenting the results to his eye in the columns of a printed page. The above remarks are given because it was from a perusal of an article in the *Edinburgh Review* for July, 1834, describing Mr. Babbage's machine, that the Swedish machine has taken its origin. Mr. George Scheutz, at that time the editor of a technological Journal at Stockholm, after reading this article derived the idea of constructing a machine for the same purpose as Mr. Babbage's, but after satisfying himself of the practicability of the scheme, he laid it aside for prosecution at a future period.

Three years afterwards, in the summer of 1837, his son, Mr. Edward Scheutz, at that time a student at the Royal Technological Institute at Stockholm, undertook the construction of the machine, his father giving him the use of work-room, lathe, and tools, with their appliances, such as a severe economy enabled him to procure, and in the absence in Sweden of those precious but expensive machine tools which constitute the power of British workshops. He commenced his work, and by the end of the summer vacation he had so far completed a model as to demonstrate the feasibility of the work he had undertaken.

Having proceeded thus far, the father applied to the government in October of that year for their sanction and assistance, but to this application a negative reply was given in the February following.

Not discouraged, Mr. E. Scheutz continued his labours, consulting from time to time with his father, sometimes one and sometimes the other suggesting improvements or expedients by which difficulties might be overcome. After many trials and alterations, the model was, in 1840, so far completed as to calculate correctly "series with terms of five figures and one difference, also of five figures," and by the end of April, 1842, its power was extended to "calculate similar series, with two or three orders of differences." In 1843 the machine, with the printing apparatus, was ready for inspection by the Royal Swedish Academy of Sciences, and after several trials a certificate, dated the 18th September, 1843, was signed by Baron Jacob Berzelius, Secretary of the Academy, R. H. Selander, Astronomer of the Academy, and E. B. Lilliehöök, R.N., Professor of Natural Philosophy in the Royal Military Academy at Marieberg. The following passages are extracted from the certificate:—

"The apparatus in question is composed of three parts.

"1st. The Calculating Machine.—It cannot compute series of a higher degree than the third, nor does it give complete terms exceeding five figures; but in the nature of the mechanism, there is nothing to prevent its extension to the working of series of any degree whatever, and to terms of as many figures as the purpose may require.

"2nd. The Printing Machine.—Every term given by the calculating apparatus is expressed by printed figures, closely arranged in lines, as in a printed table, the lines being impressed on some softer material, adapted to receive galvanoplastic or stereotyped copies. All the lines succeed each other very correctly in the same vertical column.

"3rd. The Numbering Machine.—With the printing machine, another apparatus is combined, which prints the arguments before every term. The machine is put in motion by turning the handle of a winch, by means of which, and without further manipulations, the calculation, as well as the printing and arranging of figures and lines, are effected."

The inventors, furnished with this certificate, sought orders in various countries but without success, and the machine remained shut up in its case for the ensuing seven years. Another inspection was then made by a committee of the Royal Academy of Sweden, and in the beginning of 1851, Mr. George Scheutz made a further application to the government for means to construct a larger and more perfect machine. The Royal Academy of Science, as advisers of the government, recommended that the request should be granted, because, as their report says:—

"The Messrs. Scheutz had devoted many years of labour to this invention, which, without the least doubt would be useful to science; and had incurred expenses, which, with relation to their resources were very considerable; and that Mr. Scheutz, sen., had for a long time, without assistance from the public, published many useful works in his native country, relating to industrial progress."

The government, however, replied that "there were no public funds at their disposal for the object in question."

On the motion, however, of Mr. Brinck, a merchant, and member of the Diet for Stockholm, the diet in 1851 voted a recompense in the way of money to the inventor, to be paid after the king, on due examination, should be satisfied that the machine was completed and answered its purpose. This arrangement was subsequently, on the petition of the inventors altered, and the money, about £280, was at once handed over to the inventors to enable them to complete the invention, on condition of the money being refunded if the machine was not completed before the end of the year 1853. By means of their own exertions, and the noble assistance of some members of the Swedish Academy, a sufficient number of subscribers to a guarantee for this purpose was obtained. The first working drawing was finished on the 1st of February, 1852, and the machine was completed before the end of October, 1853. The original model was confined in its working to the decimal scale, and could not produce tables with hours, degrees, minutes, &c., nor could it effect the requisite corrections in the last figure printed. It is understood, that to General Baron Fabian Wrede the merit of suggesting these important improvements is due.

The machine was constructed in conformity with the drawings of Mr. Edward Scheutz, and under his immediate superintendence, at the manufactory of Mr. C. W. Bergström, at Stockholm; and when all the parts were finished, and finally put together, the new machine performed its work so perfectly, that the first trials required no alteration whatever. In the report to H. M. King of Sweden, the Royal Academy not only declared that the machine answered its purpose, but at the same time expressed its conviction, founded on the evidence of facts, that the expenditure for the completed machine had far exceeded the sum awarded as the national recompense. His Majesty then proposed to the Diet to give the inventors an additional recompense, of the same amount as the former one, which proposition was agreed to in August, 1854, and £280 in addition to the former grant was made, in all £560.

In 1854, the inventors brought their machine to England, and it was first exhibited at Bermondsey, at the manufactory of Messrs. Bryan, Donkin and Co., where they met with Mr. W. Gravatt, F.R.S., who took much interest in the invention, gave notice to the Royal Society of the arrival of the machine, and explained its operation to many of the members. The machine was afterwards deposited at the Royal Society's rooms in Somerset-house, and was examined on many occasions by numerous visitors.

The machine was exhibited in the French Exhibition in 1855, and the gold medal was awarded to the inventors.

Under the advice of Mr. Gravatt, it was resolved that the machine should be brought again to England, and that specimen tables should be printed to show the practical utility of the machine. Mr. Gravatt offering to set apart a room in his own house for the purpose. Previous to the machine coming back to England, it was shown at work in the French Imperial Observatory.

After Mr. E. Scheutz's return to London, as soon as the machine was put in order, and he had consulted Mr. Babbage and Mr. Gravatt with regard to the specimen tables to be printed, the work was commenced, the calculations for setting the machine being made partly by Mr. Gravatt, according to formulæ of his own, and partly by Mr. E. Scheutz, after formulæ which General Baron Fabian Wrede had the kindness to give him on his departure from Sweden.

Meanwhile, what had been passing in London and in Paris had not escaped the notice of Professor B. A. Gould, of the Dudley Observatory, Albany, in the United States, who, conceiving the possibility of procuring purchasers for the machine in America, exerted himself in the most liberal and enlightened spirit to accomplish this object. The inventors had so many times seen their hopes blighted, that they did not expect that anything decisive would result from this new attempt; but they found themselves mistaken, for, after some time, they received information from Professor Gould that the terms they had proposed had been accepted; the machine, therefore, now belongs to the Dudley Observatory, at Albany, being a gift to that Observatory from an enlightened and public-spirited merchant of that city, John Fr. Rathbone, Esq.

The following extract, from the preface to the tables published, describes the machine and its capabilities:—

"It may be as well to premise that the size of the whole machine, when placed on its proper stand and protected by its cover, is about that of a small square pianoforte.

"The calculating portion of the machine, which appears in the front of the drawing, consists of a series of fifteen upright steel axes, passing down the middle of five horizontal rows of silver-coated numbering rings, fifteen in each row, each ring being supported by, and turning concentrically on its own small brass shelf, having with it a hole rather less than the largest diameter of the ring. Round the cylindrical surface of each ring are engraved the ordinary numerals from 0 to 9, one of which, in each position of the ring, appears in front, so that the successive numbers shown in any horizontal row of rings may be read from left to right, as in ordinary writing.

"The upper row exhibits the number or answer resulting from the calculation to fifteen places of figures, the first eight of which the machine stereotypes. The numbers seen on the second row of rings constitute the first order of differences, also to fifteen places of figures, if that number be required; and the third, fourth, and fifth row of rings, in like manner, exhibit the second, third, and fourth orders of differences. Any row can be set by hand, so as to present to the eye any number expressed according to the decimal scale of rotation; such as the number 987654321056789, the first eight figures of which, if in the uppermost row, would, on being calculated by the machine, be immediately stereotyped. But by simply changing a ring in each of two of the vertical columns, the machine can be made to exhibit and to calculate numbers expressed in the mixed senary system of notation, as in that of degrees, minutes, seconds, and decimals of a second. Thus, for instance, if the result 874324687356402 were indicated in the upper row of rings, it would be stereotyped 87 degrees, 43 minutes, 24·69 seconds. While this process is going on, the argument proper to each result is at the same time also stereotyped in its proper place; nothing more being required for that purpose than to set each row of figure rings to differences previously calculated from the proper formula, and to place a strip of sheet lead on the slide of the printing apparatus; then, by turning the handle (to do which requires no greater power than what is exerted in turning that of a small barrel-organ), the whole table required is calculated and *stereomoulded in the lead*. By this expression is meant that the strip of lead is made into a beautiful stereotype mould, from which any number of sharp stereotype plates can be produced ready for the working of an ordinary printing press. At the average rate of working the machine, 120 lines per hour of arguments and results are calculated and actually stereotyped, ready for the press. It is found on trial that the machine calculates and stereotypes, without chance of error, two and a-half pages of figures in the same time that a skilful compositor would take merely to set up the types for one single page.

"The appearance of the tables would have been much improved had the machine been provided with better steel figure-wheels, the reason for not adopting which alteration may be gathered from the little historical sketch herein given.

"In order to limit the size of this little book, the specimens given are neither so numerous nor so extensive as was at first intended. A great number of tables were suggested,* but they all so evidently came within the power of this machine, and as mere repetition was to be avoided, the short specimens Nos. 2, 3, 4, 5, 6, 7, 8, 9, 10, and 11 were considered sufficient as examples of tables perfectly easy with this machine, which happens to be limited to four orders of differences.

"Specimen 12, the radius vector of Venus, and 13, the sun's longitude for every twenty-four hours, are examples of calculations also easily within the power of four differences, but of which the number of terms obtainable at such wide intervals at one setting is considerably less than in the first-mentioned specimens. If, however, we wanted the sun's longitude, or the radius vector of Venus, or any similar table, for intervals of every three hours, for instance, it is evident that the machine could produce at each setting a table of eight times the extent of the specimens given.

"In specimen 14, the logarithm of the earth's radius vector, and still more in specimen 15, the logarithm of the distance between the earth and Mars, in consequence of the wideness of the intervals, the want of more than four orders of differences, or the addition of some such contrivance as Mr. Babbage has alluded to in his letter to Sir H. Davy, July 3rd, 1823, begins to be felt. Should, however, five places of decimals be considered sufficient, double the number of terms could be produced in one setting in each of the specimens 14 and 15; or, if the intervals were smaller, the same remark would apply to these specimens as to specimens 12 and 13; and it must be borne in mind, that, however short the range may be in this machine at any one setting, the answers are calculated indifferently in either the decimal or in the mixed senary scales, and stereomoulded at the same time without chance of error."

It seems difficult to understand why so little notice of so important a machine should have been bestowed upon it by the Royal Society as a body, though, doubtless, there are many among its members who did appreciate its merits, and who, by their sympathy and friendship, cheered its inventors in their struggles and difficulties.

In Mr. Babbage, the inventors found a warm friend and energetic advocate. At the annual meeting of the Royal Society, Mr. Babbage brought the subject before the members. After agreeing in the justice of the award of the Copley medal to M. Foucault, and the first and second royal medals to Messrs. Hind and Westwood, he said:—

"There is, however, an instrument to which we have given hospitality during many months in these apartments, which I think highly deserving of a medal; and I had hoped that on the present occasion it might at least have been considered worthy of being placed amongst the list of candidates for that honour. I allude to the admirable machine for calculating and printing tables by differences, and producing a mould for the stereotype plates to print the computed results—an instrument we owe to the genius and persevering labour of Mr. Scheutz of Stockholm. A committee of the Royal Society has already reported upon the machine, and I can myself bear testimony to the care and attention which our secretary bestowed upon that valuable report. But as some misapprehension exists in the public mind respecting the originality displayed in that invention, I trust that having, as is well known, given much attention to the subject, I may be permitted briefly to explain some of its principles, and thus render justice to its author." * * * * * *

After bearing testimony to the great merit of the machine, and recounting the difficulties and struggles of the inventors, Mr. Babbage proceeded to say:—

"A glance at this machine will convince any competent judge that this sum* must be very far from replacing the mere money expended, during a period of almost twenty years, in its contrivance and construction. But Sweden has thus secured for herself the glory of having been the first nation practically to produce a machine for Calculating Mathematical Tables by Differences, and Printing the Results. Wealthier and more powerful nations will regret that the country of Berzelius should thus have anticipated them, in giving effect to an invention which requires for its perfection the tools of nations more highly advanced in mechanical science. But there is still left to them the honour of acknowledging the services of a foreigner, from which the richest and most commercial countries will derive the greatest advantage."

It must ever remain a reproach that the *savans* of this country permitted the machine to quit our shores, and that no one of a nation which prides itself above all things on being practical, should have been sufficiently interested in the instrument, as to take the course of the enlightened American citizen, and purchase it for the use of one of our National Institutions.

EDUCATIONAL CONFERENCE.

The first of the three general Conferences for discussing the Educational question, especially in relation to the early age at which the children of the working classes are removed from school, was held on Monday, at Willis's Rooms, under the presidency of Prince Albert. Long before the hour fixed for taking the chair the room was completely crowded, and the reception accorded to his Royal Highness on his arrival was most warm and flattering. Among those present were Earl Granville, the Bishops of London, Oxford, St. Asaph, Durham, Sodor and Man, Winchester, and Manchester; Lord Brougham, Lord Ward, Lord Calthorpe, Sir John Pakington, Lord Kinnaird, Mr. Robert Owen, Major General Grey, Miss Carpenter, &c. His Royal Highness on taking the the chair addressed the meeting as follows:—

"Gentlemen, we have met to-day in the sacred cause of Education—of National Education. This word, which means no less than the moral and intellectual development of the rising generation, and, therefore, the national welfare, is well calculated to engross our minds, and opens a question worthy of a nation's deepest interest and most anxious consideration. Gentlemen, the nation is alive to its importance, and our presence here to-day gives further evidence (if such evidence were needed) of its anxiety to give it that consideration. Looking to former times, we find that our forefathers, with their wonted piety and paternal care, had established a system of national education, based upon the parish organisation and forming part of parish life, which met the wants of their day, and had in it a certain unity and completeness which we may well envy at the present moment. But in the progress of time our wants have outstripped that system, and the condition of the country has so completely changed even within these last 50 years that the old parochial division is no longer adequate for the present population. This has increased during that period in England and Wales from, in round numers, 9,000,000 to 18,000,000, and, where there formerly existed comparatively small towns and villages, we now see mighty cities, like Liverpool, Manchester, Hull, Leeds, Birmingham, and others, with their hundreds of thousands, springing up almost, as it were, by enchantment; London having increased to nearly two and a half million of souls, and the factory district of Lancashire alone having aggregated a population of nearly 3,000,000 within a radius of 30 miles; This change could not escape the watchful eye of a patriotic public; but how to provide the means of satisfying the new wants could not be a matter of easy solution. While zeal for the public good, a fervent religious spirit, and true philanthropy are qualities eminently distinguishing our countrymen, the love of liberty and an aversion from being controlled by the power of the State in matters nearest to their hearts, are feelings which will always most powerfully influence them in action. Thus the common object has been contemplated from the most different points of view, and pursued often upon antagonistic principles. Some have sought the aid of Government, others that of the Church to which they belong; some have declared it to be the duty of the State to provide elementary instruction for the people at large, others have seen in State interference a check to the spontaneous exertions of the people themselves, and an interference with self-government; some, again, have advocated a plan of compulsory education based upon local self-government, and others the voluntary system in its widest development. While these have been some of the political subjects of difference, those in the religious field have not been less marked and potent. We find, on the one hand, the wish to see secular and religious instruction separated, and the former recognised as an innate and inherent right, to which each member of society has a claim, and which ought not to be denied to him if he refuses to take along with it the inculcation of a particular dogma to which he objects as unsound; while we see, on the other hand, the doctrines asserted that no education can be sound which does not rest on religious instruction, and that religious truth is too sacred to be modified and tampered with, even in its minutest deductions, for the sake of procuring a general agreement. Gentlemen, if these differences were to have been discussed here to-day I should not have been able to respond to your invitation to take the chair, as I should have it thought inconsistent with the position which I occupy and with the duty which I owe to the Queen and the country at large. I see those here before me who have taken a leading part in these important discussions, and I am happy to meet them upon a neutral ground; happy to find that there is a neutral ground upon which their varied talents and abilities can be brought to bear in communion upon the common object; and proud and grateful to them that they should have allowed me to preside over them for the purpose of working together in the common vineyard. I feel certain that the greatest benefit must arise to the cause we have all so much at heart by the mere free exchange of your thoughts and various experience. You may well be proud, gentlemen, of the results hitherto achieved by your rival efforts, and may point to the fact that, since the beginning of the century, while the population has doubled itself, the number of schools both public and private has been multiplied 14 times. In 1801 there were in England and Wales, of public schools, 2876; of private schools, 487—total, 3363. In 1851 (the year of the Census) there were in England and Wales, of public schools, 15,518; of private schools, 30,524—total, 46,042; giving instruction in all to 2,144,378 scholars; of whom 1,422,982 belong to public schools, and 721,396 to the private schools. The rate of progress is further illustrated by statistics which show that in 1818 the proportion of day scholars to the population was 1 in 17; in 1833, 1 in 11; and in 1851, 1 in 8. These are great results, although I hope they may only be received as instalments of what has yet to be done. But what must be your feelings when you reflect upon the fact, the inquiry into which has brought us together, that this great boon thus obtained for the mass of the people, and which is freely offered to them, should have been only partially accepted, and upon the whole so insufficiently applied as to render its use most valueless? We are told that the total population in England and Wales of children between the ages of 3 and 15 being estimated at 4,908,696, only 2,046,848 attend school at all, while 2,861,848 receive no instruction whatever. At the same time an analysis of the scholars with reference to the length of time allowed for their school tuition shows that 42 per cent. of them have been at school for less than one year, 22 per cent. during one year, 15 per cent. during two years, 9 per cent. during three years, 5 per cent. during four years, and 4 per cent. during five years. Therefore out of the two millions of scholars alluded to more than one million and a half remain only two years at school. I leave it to you to judge what the results of such an education can be. I find further that of these two millions of children attending school only about 600,000 are above the age of nine. Gentlemen, these are startling facts, which render it evident that no extension of the means of education will be of any avail unless this evil, which lies at the root of the whole question, be removed, and that it is high time that the country should become thoroughly awake to its existence and prepared to meet it energetically. To impress this upon the public mind, is the object of our conference. Public opinion is the powerful lever which in these days moves a people for good and for evil, and to public opinion we must therefore appeal if we would achieve any lasting and beneficial results. You, gentlemen, will richly add to the services which you have already rendered to the noble cause if you will prepare public opinion by your inquiry into this state of things, and by discussing in your sections the causes of it as well as the remedies which may lie within our reach. This will be no easy matter; but even if your labours should not result in the adoption of any immediate practical steps, you will have done great good in preparing for them. It will probably happen that, in this instance as in most others, the cause which produces the evil will be more easily detected than its remedy, and yet a just appreciation of the former must ever be the first and essential condition for the discovery of the latter. You will probably trace the cause of our social condition to a state of ignorance and lethargic indifference on the subject among the parents generally; but the root of the evil will, I suspect, also be found to extend into that field on which the political economist exercises his activity—I mean the labour market—demand and supply. To dissipate that ignorance and rouse from that lethargy may be difficult, but with the united and earnest efforts of all who are the friends of the working classes it ought, after all, to be only a question of time. What measures can be brought to bear upon the other root of the evil is a more delicate question, and will require the nicest care in handling, for there you cut into the very quick of the working man's condition. His children are not only his offspring, to be reared for a future independent position, but they constitute part of his productive power and work with him for the staff of life; the daughters especially are the handmaids of the house, the assistants of the mother, the nurses of the younger children, the aged, and the sick. To deprive the labouring family of their help would be almost to paralyse its domestic existence. On the other hand, carefully collected statistics reveal to us the fact that while about 600,000 children between the ages of 3 and 15 are absent from school, but known to be employed, no less that 2,200,000 are not at school, whose absence cannot be traced to any ascertained employment or other legitimate cause. You will have to work, then, upon the minds and hearts of the parents, to place before them the irreparable mischief which they inflict upon those who are entrusted to their care by keeping them from the light of knowledge, to bring home to their conviction that it is their duty to exert themselves for their children's education, bearing in mind at the same time that it is not only their most sacred duty, but also their highest privilege. Unless they work with you, your work, our work, will be vain; but you will not fail, I feel sure, in obtaining their co-operation if you remind them of their duty to their God and Creator. Our Heavenly Father, in his boundless goodness, has made his creatures that they should be happy, and in his wisdom has fitted his means to his ends, giving to all of them different qualities and faculties in using and developing which they fulfil their destiny, and, running their uniform course according to his prescription, they find that happiness which he has intended for them. Man alone is born into this world with faculties far nobler than the other creatures, reflecting the image of Him who has willed that there should be beings on earth to know and worship Him, but endowed with the power of self-determination, having reason given him for his guide. He can develope his faculties, place himself in harmony with his Divine prototype, and attain that happiness which is offered to him on earth, to be completed hereafter in entire union with Him through the mercy of Christ. But he can also leave these faculties unimproved, and miss his mission on earth. He will then sink to the level of the lower animals, forfeit happiness, and separate from his God, whom he did not know how to find. Gentlemen, I say man has no right to do this, he has no right to throw off the task which is laid upon him for his happiness; it is his duty to fulfil his mission to the utmost of his power; but it is our duty, the duty of those whom Providence has removed from this awful struggle and placed beyond this fearful danger, manfully, unceasingly, and untiringly to aid by advice, assistance, and example, the great bulk of the people, who, without such aid, must almost inevitably succumb to the difficulty of their task. They will not cast from them the aiding hand, and the Almighty will bless the labours of those who work in his cause."

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* Such as second logarithms, anti-logarithms, powers of sines, &c., natural sines, &c., life annuity tables, interest tables, difference of latitude and departure, mensuration, flow of water in canals and through pipes, earthwork tables, &c.

* The £560 mentioned as granted by the Swedish Government.

The Secretary then read the report, which recapitulated the various points of interest dwelt upon in the speech of Prince Albert, and stated that since 1839, £2,000,000 had been expended in the erection of school buildings, thus affording the means of education to more than 500,000 children, while a sum exceeding £1,250,000 was annually expended for the support of schools for the children of the working classes. Lord Brougham next addressed the meeting, and said that in the present state of affairs he believed that a great deal might be done by enlisting on their side the great employers of labour, and by means of the masters influencing the men to avail themselves more extensively of the means of education for their children which were brought within their reach. The Bishop of Oxford said that the difficulty which they had to overcome was not to provide schools for the children, but children for the schools. They must first discover the cause of this evil before they could offer to administer to its cure. He believed that, over and above the causes for the absence of young children from the schools, was the want of firm authority on the part of parents, and the want of a willing obedience on the part of the children. They must exert themselves to show to the vast body of parents that the use of the schools was a positive and certain gain to their children; but for this purpose they must be united among themselves, and the disputes and differences as to the boon to be given must cease. The present Conference would do much to heal such divisions among the promoters of education, and but for the unhappy differences that had existed, he believed the strong moral sense of the people of England would of itself have done away with all the needless causes for suspicion. The Rev. Canon Moseley said that the cause which led the children of working men to be so early removed from school was to be found in the indifference of parents, not in their poverty or want of affection, but in their want of proper appreciation of the value which education would be to their children in their struggle through life. His Royal Highness then formally declared the Educational Conference opened, and adjourned the proceedings to the following day.—On Tuesday, the five sections of the Conference met at the Thatched House Tavern for the purpose of discussing the papers submitted to them. Between 30 and 40 papers on the different points of interest connected with a great scheme of education were read and discussed. All the rooms in which the meetings were held were much crowded throughout the day, the great majority of the audience being clergymen connected with schools for the children of the working classes in all parts of the country. In *Section A* the chairman was the Bishop of Oxford, the Rev. F. Watkins, one of her Majesty's inspectors of schools, officiating as secretary. The object of this section was to inquire into the fact of the alleged early removal of children from school in the agricultural, manufacturing, and mining districts of England, Scotland, and Wales; and into the causes of such early removal and its results. *Section B* was presided over by the Right Hon. W. Cowper, M.P., the Rev. J. D. Glennie, jun., officiating as secretary. The papers read in this section were an inquiry into the circumstances attending the removal of children from the schools in continental countries, with a view to seeing how far that removal took place at a later or an earlier age as compared with the same event in this country. In *Section C* the Chairman was Sir J. Kay Shuttleworth, Bart., the Rev. Nash Stephenson officiating as secretary. The object of this section was to consider the expedients which have been proposed for keeping the children of the working classes longer at school, under the heads of certificate schemes and prize schemes. In *Section D*, which was presided over by the Dean of Salisbury, the business was the consideration of the merits of the half-time schemes, being schemes for the occupation of children half their time at school and half at labour; the same arrangement being proposed to be made by parents and employers voluntarily, as is made compulsorily under the provisions of the Factory Bill. In *Section E*, which was presided over by the Dean of Bristol, the surplus papers which it was found impossible for the other sections to consider in the time allotted for their sittings were read.—The final meeting of the Conference took place on Wednesday, at Willis's Rooms. Earl Granville took the chair, and called upon the chairmen of the different sections to present their reports. The Bishop of Oxford, as chairman of *Section A*, submitted the conclusions at which they had arrived, and embodied them in the following resolution:—

> "That it is the opinion of this Conference that the greater number of the children of the working classes are removed from school at so early an age as seriously to interfere with their education. That while this Conference is precluded from entering on the question of legislative interference, it would call the attention of the friends of education to the positive amount of good which may be effected as to increasing the age to which children continue at school by the improvement of the schools themselves, and bringing moral and religious influences to bear upon both the parents and children."

Sir J. Pakington seconded the resolution, which was supported by the Marquis of Lansdowne and carried unanimously, the meeting having declined to entertain an amendment offered by Mr. Robert Owen. The Right Hon. W. Cowper, M.P., then moved the following resolution embodying the conclusions of *Section B*:—

> "That throughout the north of Europe the children of the working classes are kept for a longer period at school, and to a riper age, than in this country."

Mr. Akroyd, M.P., seconded the resolution, which was carried unanimously. Sir J. K. Shuttleworth, as chairman of *Section C*, then moved the following resolution:

> "That registration, certificate, and prize schemes have been shown to have been applied in certain localities with advantage, and to be worthy of more extensive trial."

Mr. E. Baines, of Leeds, seconded, and the Rev. Canon Girdlestone supported, the resolution, which was put and carried. The Dean of Salisbury then moved the following resolution, as chairman of *Section D*:—

> "That the voluntary half-time schemes have been with success adopted in certain localities, and may be recommended for further trial."

Mr. S. Morley seconded the resolution, which was agreed to. The Dean of Bristol then moved the following, as chairman of *Section E*:—

> "That this Conference considers the encouragement of industrial education in elementary schools, especially among girls, to be very desirable, and that such instruction is peculiarly important in the reformation of juvenile offenders."

The Hon. and Rev. G. M. Yorke seconded the resolution, which was supported by Mr. J. Symons, and carried. The Bishop of Sodor and Man then moved that the Conference be adjourned, and that it be referred to the general committee to prepare and publish a public report of the proceedings, with a selection of the papers, and to determine as to the time and place of its next meeting. Mr. C. H. Bracebridge seconded the resolution. The Rev. G. S. Bull, Rector of St. Thomas's, Birmingham, moved the following addition to the resolution as an amendment:—

> "That it is most desirable that the fullest and most accurate investigation of the subjects brought before the Conference should be continued, and that all suitable and possible remedies should be discussed; but seeing that this Conference is by its constitution and form of invitation prevented from the discussion of legislative measures, it is expedient in any future meetings of the Conference to admit of the fullest discussion of every means that may be suitable to extend the opportunities of a Christian education."

The Rev. Dr. Bayley seconded the amendment. A long and irregular discussion ensued, the supporters of the amendment contending that some of the resolutions, and, above all, some remarks made by Mr. Samuel Morley, were hostile to the principle of legislative enactment with regard to education. Mr. Morley expressed his regret at having said anything calculated to impugn the principles of any of his hearers; and, further conciliatory addresses having been made on both sides, the Rev. Mr. Bull withdrew his amendment, on the understanding that upon future occasions the supporters of the voluntary principle would abstain from comments against legislational enactments in favour of education. The original motion of the Bishop of Sodor and Man was then put, and carried unanimously. A vote of thanks to the Earl Granville and Mr. Cowper brought the proceedings to a close.

WARMING AND VENTILATING.

Extensive experiments have been made during the last season on this subject by Mr. Goldsworthy Gurney, who has, at length, achieved great success in endeavouring to solve the difficult problem of satisfactorily warming and ventilating buildings.

In 1852, Mr. Gurney was, together with the first scientific men of the day, summoned before a committee of the House of Commons, appointed for the purpose of inquiring as to the best means of warming and ventilating the House. (*See Report of the Committee ordered to be printed, May* 24, 1852. *Ses. No.* 402.

He explained to this Committee the causes of the evils then existing in the ventilation of the Houses of Lords and Commons, as well as the remedies to be applied, and he was afterwards appointed to carry out his views, in which he was successful; the main feature of success consists in the careful application of the laws of convection and conduction of heat, under the operation of which the air is gradually warmed; it is also moistened in an exact ratio with its increasing temperature, and thus kept in a natural and healthy state. In 1853, a Committee of the Peers, recognising the success in the Commons, recommended the system to be extended to their Lordships' House, (*See Report of the Committee of the Lords, ordered to be printed July* 18, 1854, *Ses. No.* 384) and the result is said to have been equally good.

It appears that many who witnessed the change in the condition of the air of the Houses of Parliament, were anxious that, if possible, the system should be extended to churches, and, at their suggestion, Mr. Gurney, after much difficulty, succeeded in simplifying his apparatus, so as to apply it economically, not only to churches, but also to private houses.

The plan has been extensively used during the past winter, and, amongst other places, at the new buildings for the Department of Science and Art, at South Kensington, where it has been placed in buildings of various descriptions, and has in all been successful.

It consists of a stove with a plain interior cylinder and a series of perpendicular radiating wings, which are portions of the same pieces of metal as the cylinder. In this cylinder is the fire, usually of coke, but it may be heated by coal, gas, steam, or hot water. The stove is placed in a pan of water, the depth of which is regulated so as to produce the required amount of evaporation.

The vapour caused by this evaporation passes, in conjunction with an ascending column of air, over the external surface of the stove rising up between the wings, and by this means prevents the stove from being over-heated, the air from being burnt or over-dried, and, under the laws of convection, causes such a rapid intermixture with the atmosphere in the apartment that it is kept at an uniform temperature, even when the stove is placed at the extreme end of an oblong room, while the healthy freshness of the air is such that it must be breathed to be duly appreciated. A further effect produced is that the heat is swept so rapidly from the surface of the stove that it is completely exhausted, and the flue pipes left so cool that they can be painted to match the building in which the stove is placed, and maintain their colour. From this fact it would be anticipated that the consumption of fuel in proportion to the heat produced is exceedingly small, and such is found by experience to be the case; the original cost of the apparatus, as compared with other means of warming, is said to be very small.

The stove can be made to introduce any amount of fresh air, and it thus contains within itself the means of promoting a perfect ventilation; this, when required, is done by having an air chamber underneath the stove, made to communicate with the purest source of supply within reach, and placed under regulation. It may be mentioned, that at St. Andrew's Church, Victoria-street, Pimlico, which was warmed on this principle, the Incumbent of the Church, the Rev. W. Walker, states that on more than one occasion, when the water supply had been accidentally neglected, he, in each case, very soon detected the omission by the peculiar action of the air affecting his throat in performing the service.

MIDDLE CLASS EXAMINATIONS.

The Vice-Chancellor and Proctors of Oxford have appointed the following distinguised members of the university delegates under the Middle Class Examination Statute, viz.:—The Rev. Dr. Hook, Christ Church, Vicar of Leeds; the Rev. Dr. Sewell, Fellow of Exeter College, and Warden of Radley College; the Rev. Robert Walker, M.A., Wadham College, Professor of Experimental Philosophy, F.R.S.; the Rev. Osborn Gordon, B.D., Censor and Tutor of Christ Church; the Rev. John W. Burgon, M.A., Fellow and Tutor of Oriel College; and the Rev. James Edwin T. Rogers, M.A., Magdalen Hall, Public Examiner. The delegacy is now complete.

EXHIBITION OF DESIGNS IN WESTMINSTER HALL.—AWARD OF THE JUDGES.

The following is a list of the artists entitled to premiums under the award of the judges of the designs lately exhibited in Westminster Hall. The names are arranged in the order of merit as decided by the judges, with the mottoes which were inscribed on the designs, together with the amount of premium awarded:—

DESIGN No. 1.—BLOCK PLAN.

		No.	Motto.	Premium.
1	M. Cressinet, Grand Rue de Vaugirard, Paris	12	"A. C."	£500
2	W. Hastings, Esq., Belfast	189	"Corso"	200
3	Messrs. Morgan and Phipson, 3, Danes-inn, Strand	128	"Confido"	100

DESIGN No. 2.—FOREIGN DEPARTMENT.

		No.	Motto.	Premium.
1	Messrs. Coe and Hofland, 8, Danes-inn, Strand	94	"Utilitas"	800
2	Messrs. Banks and Barry, 27, Sackville-street	58	"Opera, 81"	500
3	George Gilbert Scott, Esq., 20, Spring gardens	116 (a)	"Nec Minimum," &c.	300
4	Messrs. Dean and Woodward, Merrion-street, Dublin	35	"Thou hast covered my head," &c.	200
5	Thomas Bellamy, Esq., 8, Charlotte-street, Bedford-square	17	"B. Z."	100
6	Messrs. Buxton and Habershohn, 38, Bloomsbury-square	54	"Suaviter Fortiter"	100
7	George E. Street, Esq., 33, Montague-place, Bedford-square	129	"A Vaillants Cœurs," &c.	100

DESIGN No. 3.—WAR OFFICE.

		No.	Motto.	Premium.
1	H. B. Garling, Esq., 11, King's-road, Gray's-inn	77	"Fortiter et Fideliter"	800
2	M. B. D'Hazeville, Rue de Nord, Paris	75	"Deus atque Jus"	500
3	T. E. Rochead, Esq., Glasgow	61	"Anglo-Saxon"	300
4	Messrs. Pritchard and Seddon, Llandaff	140	"Cymru"	200
5	Cuthbert Brodrick, Esq., 17, East Parade, Leeds	20	"Corona"	100
6	Messrs. W. G. and E. Habershon, 88, Bloomsbury-square	54 (a)	"Au bon Droit"	100
7	John Dwyer, Esq., 11, Great Marlborough-street	126	"Westminster"	100

COLOUR BLINDNESS.

There was read at the meeting on the 13th April, 1857, at the Royal Scottish Society of Arts, an additional note on the Statistics of Colour-Blindness, by Professor George Wilson, M.D. The case in question occurred in the practice of White Cooper, Esq., the oculist, and had been examined by him and by Professor Tyndal, of the Royal Institution, Ablemarle-street, London. It was described by the last named observer, in the *Lond. and Edin. Phil. Magazine* for May 1856, and is in many respects the most remarkable example of colour-blindness on record. Its peculiarity consists in its having occurred in one whose vision of colour was originally normal, but who suddenly became colour-blind several years ago, and has remained so ever since. Captain C., commander of a small coasting vessel, was in the habit of spending some portion of his leisure in working with coloured worsteds—a practice not unusual among our merchant seamen. On one occasion he was anxious to complete a flower, but found himself unable to distinguish the colour; thinking the light at fault, he changed his place more than once, but without bettering matters, and he finally went on deck, where he realised before long that he had lost his former perception of tints. No pain, inflammation, or other morbid symptom showed itself in the organs of vision, nor do they now betray any abnormal appearance; but he has ceased in ordinary circumstances to perceive any colour but blue, and exhibits all the peculiarities of congenital colour-blindness with the additional defect of inability to distinguish yellow from white, so that he mistakes a half sovereign for a sixpence. Yet his sense of colour is only dormant; for, when red glass was shown him in front of the electric light, he recognised it as red, and spoke of it as a colour he had not seen for years. It was only, however, when very near the glass, and with the very bright light in question shining through it, that he saw red. At a little distance from the electric lamp, or quite close to a candle-flame, he could not tell the tint of an interposed red glass. In accordance with this, he mentioned to Professor Tyndal that the Portland Light, which he has occasion frequently to pass, has recently been changed in colour, but he has not observed any difference. The interest of the case lies partly in the fact of its not being an example of congenital colour-blindness, but chiefly, so far as practice is concerned, in its occuring in a sea captain, to whom the present Admiralty system of night-signals on board steamers—which tell only by their colour, viz., red or green, in what direction the steamer is sailing—is totally useless. So also are many of the lighthouse combinations of coloured lamps. Captain C., were he to trust his own eyes at night, would certainly shipwreck his vessel, so carefully have the Admiralty put it out of the power of a colour-blind pilot to help himself, by making the significance of the most important night-signals used on board steamers turn solely on colour; and it is rumoured that this dangerous system of signalling is about to be rendered imperative on sailing vessels. In continuance of this communication, the author stated that he had the authority of one of the civil engineers of the Board of Trade for mentioning that the Government inspectors of railways had found 3 per cent. of the railway servants and porters disqualified for their duties by defective vision of colour.

Colonial Correspondence.

BARBADOS GUINEA GRASS.

Downing-street, June 30th, 1857.

Sir,—I am directed by Mr. Secretary Labouchere to request that you will lay before the Council of the Society of Arts, the enclosed copy of a despatch from the Governor of Malta, relative to the introduction into that island, and into other countries in the Mediterranean, of Guinea grass from Barbados. I am, Sir,

Your obedient servant,
HERMAN MERIVALE.

The Secretary of the Society of Arts.

(Copy.)

Palace, Valletta, June 5th, 1857.

Sir,—From enquiries which I made on first coming to Malta, I was assured that the Guinea grass was unknown here, I therefore procured a box of plants from Barbados, five roots of which only arrived here alive.

2. These five roots were soon multiplied to many thousand plants, and I have had the pleasure of introducing it into the Island of Sardinia, the province of Tripoli, into Corfu, and different parts of Greece. Its value in these latitudes is greatly enhanced from the Guinea grass commencing to flourish with the heats of summer, which burn up all native grasses. I am now sending a further supply of plants to the Consul-General and Vice-Consul at Tripoli, Colonel Herman and Mr. Reade, who are growing it there successfully, and are in hopes it may succeed in some parts called "Desert," where its roots can reach moisture.

3. I have, since its introduction here, been informed that the French attempted for many years to grow it in the South of France, a climate probably too cold for it, but that it has been long known in Tunis. After it multiplied here, I found there had been a root in the island carefully preserved for thirty years as a curiosity, but never propagated. From whence it came is now unknown.

4. The most interesting experiments with the Guinea grass in this part of the world, are those making in the low moist lands of the Island of Sardinia and in the deserts of Tripoli. This tropical grass came originally from the coast of Guinea, and may succeed better as it is carried south from the coast of Barbary. In Greece and in Corfu, it will probably be killed by frosts.

I have, &c.,
(Signed) WM. REID, Governor.
The Right Hon. H. Labouchere, &c., &c., &c.

Home Correspondence.

CONFERENCE.

Sir,—You will oblige me by correcting an inaccuracy in your report of the Conference held on the 24th inst. I am made to say that I thought the value of the broad sheet *was overrated*, &c., whereas I said (what experience has taught me to be true) that the value of the broad sheet *could not be* overrated, and I added that it was not to be expected of working men generally that they would attend classes for instruction after a hard day's work. Hence the value of the knowledge imparted by means of the newspaper. I certainly said that something more than daily and weekly newspapers should be placed on the reading-room table—that such publications as the *Quarterly Review*, for instance, should not be excluded, but I would never extol the latter *against* the former. I consider *both* essential to the reading-room of a useful Mechanics' Institution. I am, &c.,

S. L. RYMER.

Croydon, June 27th, 1857.

MECHANICS' INSTITUTIONS.

Sir,—At the Conference on Wednesday last the fact of Institutions being constantly in debt, and that it was their "normal state," was mentioned by several representatives. It is, I believe, generally but too true, at the same time I cannot but think that if care was taken this state need not continue. The Institution with which I am connected was a few years ago in arrear, from the reason that the subscriptions were not regularly collected, and as it was no one's business in particular to collect them, it was left undone from year to year, until at last they accumulated to a large amount. About five years since the embarrassment of the Institution was so great that a meeting was called to consider the propriety of closing it, and selling off the property to meet the liabilities. The friends of the Institution, however, came forward and contributed very liberally, so that the debts were paid off (and they amounted to nearly £60); at the same time its state was carefully looked into; the librarian was directed to collect all subscriptions immediately they became due, a commission of 5 per cent. being allowed when the amounts were paid into the treasurer's hands. This plan has been found to succeed most admirably; the subscriptions are never in arrear, and the collector finds it worth his attention. In addition to this, all accounts were directed to be passed before the committee as soon after each quarter day as possible; by this means, every useless item of expenditure was detected and was immediately removed; thus, by careful nursing and constant supervision the Institution has steadily progressed, and at our last General Meeting we were able to announce the fact that we were perfectly free from debt and liability, and had a balance of £15 11s. 8½d. in hand. Lectures were luxuries we could not afford; we invariably lost by them; we, therefore, were compelled to abstain from them for a season, after which a series of papers on literary and scientific subjects were read by some of our members and friends, and the results have been so satisfactory, that we have each season had a balance of cash in hand instead of being minus a few pounds as before (at the same time we do not undervalue good professional lecturers, our only difficulty being to pay them the amount which their talents merited). We have found the Hand Book for Mechanics' Institutions a most useful book. I would most strongly recommend it to the notice and attentive perusal of the managers of Institutions.

Finally, with regard to the formation of classes, it must entirely depend upon the taste of the members. We have had most successful classes one season, and perhaps the next there have been so few desiring instruction, that all we could do was to provide books, &c.; a master for the few pupils was quite out of the question. I therefore sincerely trust that attendance at a class in an Institution may not be an indispensable requisite in candidates for the Society of Arts Examinations, as by that means we might exclude many worthy young men, members of small Institutions in agricultural districts, whom we ought especially to encourage, and who may possibly be the only members who have so well occupied their time. I know that it is next to impossible in such districts to form classes, from the simple fact that there are not pupils enough; at the same time, I consider it even more meritorious for the young man who is entirely self-taught, than for those who have every facility, as in our larger towns and cities. Trusting that every member of an Institution in Union may be still admitted, whether he has studied in a class or not, I am, &c.,

JOSEPH POLLARD,
Treasurer to the Hitchin Mechanics' Institution.

MECHANICS' INSTITUTIONS.

Sir,—The Report presented at the Annual Conference of Delegates last week contained allusions to several interesting facts connected with the operations of Mechanics' Institutes, although the order of subjects for consideration at the meeting precluded the discussion of several of them. It was, however, very truly stated that much good might be effected by making more use of the columns of the *Journal* than had hitherto been done. It is with this view that I beg to call attention so some of the most important points in connexion with these valuable aids to the diffusion of useful knowledge. Fortunately there are now very few who need to be convinced of the necessity of disseminating instruction to all classes. To those few I would say that we have a population not only increasing in numbers, but more rapidly in resources, in material wealth, and in the means of gratifying their desires, and that unless we train their intellectual and moral faculties they will become far more dangerous than preceding generations. To accomplish this end no means have proved more effectual than the establishment of Mechanics' Institutes; and to render these still more successful the Society of Arts has devoted its great name and powerful organisation with most praiseworthy zeal.

In order that these Institutes may really fulfil their avowed object, they must be made self-supporting, relying less upon the munificence of individuals and more upon the class for whom they are designed. The remark so often made that they are no longer *Mechanics'* Institutes, but places for recreation of the middle classes, is not true, except it may be as far as concerns the metropolis and some few large towns. The great majority are truly colleges of the working classes, and might, I believe, be greatly extended if a few great principles in the management of them were better attended to, and to this I would beg the attention of your readers. I am aware that circumstances in different places materially vary, but wherever there is a number of working people, some of whom require elementary instruction, the following suggestions may prove useful.

The most important feature in practical usefulness is perhaps evening classes, which, in a mixed population, should be of two kinds—elementary, and for more advanced students. The one supplying the defects of early education, the other providing the means of mental cultivation. I would suggest that an Institute should have at least two class-rooms, and that the elementary classes should be under the management of a competent teacher, to be paid by the fees of the pupils. Other classes should be on the principle of mutual instruction, taking some work of reputation as a guide, or text-book; and a class of each kind might occupy each room, dividing the week, so that all the members might have the opportunity of enjoying a fair share of the advantages. For this purpose I propose the following arrangement:—

	Elementary.	Mutual Improvement.
Monday......	Reading....................	Chemistry
Tuesday ...	Writing & Arithmetic	Drawing
Wednesday	Females.	
Thursday...	Reading....................	Elocution and Discussion.
Friday	Writing & Arithmetic	Mathematics
Saturday ...	Vocal Music	... ...

In the class for females, if in a maunfacturing town or village, plain needlework might be taught with much advantage, and rendered very attractive to the pupils by some person reading aloud. On Saturday the music should be of a sacred character, so as to form not only a fitting preparation for the following day, but improve the musical part of divine service. The pupils should commence with the practice of psalms and hymns; as they become more proficient they might practice anthems, and in time proceed to oratorios. There is no class of vocal music more permanently popular and attractive, and at the same time more suited to moral elevation.

With reference to mutual improvement classes, I have named only a few subjects likely to prove useful, but these will of course depend on the wishes of the students, the number of members, and the accommodations of the Institute. Classes of this character might be formed with special reference to the examinations of the Society of Arts, but, whatever be the subject selected, I believe, the majority may be far more usefully taught on the principle of mutual instruction than by a professed teacher. Each member of the class should be in turn the instructor of the others, and, with a safe guide, would not fail of success, besides the additional recommendation of greater economy.

In a future letter I shall offer some remarks upon the other departments of a Mechanics' Institute, more particularly with reference to that all-important subject the financial department.

EPHRA.

Proceedings of Institutions.

London Mechanics' Institution.—On Saturday last, a deputation of gentlemen connected with the London Mechanics' Institution, consisting of Mr. Birkbeck, president; Mr. V. Knight, one of the vice-presidents; Mr. James Gowland, treasurer; Mr. Vallentine, chairman; and Mr. J. R. Taylor, hon. secretary of the special committee; Mr. T. A. Reed, Mr. S. Davey, Mr. Brooman, and Mr. M'Farlane, secretary, waited upon Earl Granville, at the office of the Privy Council, for the purpose of requesting a grant of money, to relieve the Institution from its present heavy liabilities. It was stated by the members of the deputation, that the Institution—the first ever established—laboured under serious difficulties, in consequence of a building debt incurred at the period of its establishment. Between £4,000 and £5,000 was advanced by Dr. Birkbeck, the greater part of which remained unpaid. In the early and flourishing days of the Institution, the debt was a comparatively light burden, but it was now so seriously felt, that the very existence of the Institution was considered to be dependent on some extraneous aid for relief from its liabilities. His lordship expressed his sense of the great benefits conferred upon society by the London Mechanics' Institution; intimated to the deputation that, under the Minutes of Council, no grant could be made for the payment of past debts, but that assistance would probably be rendered to the schools and classes, so as to increase their educational value, and to any efforts that might be made to rebuild the Institution, and to render it more available for the purposes of instruction. It was arranged that Mr. J. R. Taylor, the honorary secretary of the special committee of the Institution, should have another interview with the authorities, to make the necessary preliminary arrangements.

MEETINGS FOR THE ENSUING WEEK.

MON. Royal Inst., 2. General Monthly Meeting.
Entomological, 8.
WED. Literary Fund, 3.
FRI. United Service Inst., 3. Lieut.-Col. E. Wilford, "On the Rifle; showing the necessity for its introduction as an universal Infantry weapon, the system by which it is now introduced, and the advantage which must result therefrom."
SAT. Royal Botanic, 3¾.

PARLIAMENTARY REPORTS.

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SESSIONAL PRINTED PAPERS.

PAR. NO.

Delivered on June 24th.

71. ——— Transportation and Penal Servitude (Lords Amendments).
Neuchatel—Treaty.

Delivered on June 25th.

38 (6). Civil Services, Estimates—Class 6 (a corrected sheet).
107. Schools in Rural Districts—Return.
68. Bills—Lunatics (Scotland).
72. ——— Court of Session (Scotland).
75. ——— Bankruptcy and Real Securities (Scotland).
76. ——— Bill Chamber (Scotland).
77. ——— Married Women's Reversionary Interest (as amended in Committee, and on consideration of Bill as amended).
81. ——— Summary Proceedings before Justices of the Peace.
82. ——— Municipal Corporations.
83. ——— Hanley Borough Incorporation.
84. ——— Christ Church (West Hartlepool).

Delivered on June 26th.

49 (1). Trade and Navigation Accounts (31st May, 1857).
116. Harbours of Refuge—Return.
100. Lunatic Asylums (Scotland)—Copy of a Memorial.
73. Bills—Public Charities.
74. ——— Crown, &c., Suits (Scotland).
78. ——— Railway Traffic Act Amendment.
80. ——— Evidence upon Oath (House of Commons).

Delivered on June 27th and 29th.

4. Electors, &c.—Return.
102. Copper, &c.—Account.
114. Constabulary (Ireland)—Statement.
118. Cheese—Account.
128. Rochdale Election (Newall's Petition)—Report from the Committee.
69. Bills—Weights and Measures.
87. ——— Attornies and Solicitors (Colonial Courts).
89. ——— Constabulary Force (Ireland).
91. ——— Banking.
94. ——— Smoke Nuisance (Scotland) Abatement.
90. ——— Revising Barristers (Dublin).
China (Naval Forces at Canton)—Further Papers.

Delivered on June 30th.

110. East India—Home Accounts.
130. Australian Colonies (Land Sales)—Return.
125. Emigration (North American Colonies)—Return.
86. Bill—Divorce and Matrimonial Causes.
93. ———Adulteration of Food or Drink.

Delivered on Juty 1st.

4. Electors, &c.—Return (corrected pages).
74. Guano—Reports from Naval Officers on Foreign Stations.
87. Steam Vessels—Return.
113. Ministers' Money (Ireland)—Return.
123. Divorce Acts—Divorce (Scotland)—Returns.
140. Electoral Law (Tasmania)—Return.
85. Bills—Reformatory Schools (amended).
92. ——— Justices and Police Force (Dublin).
95. ——— Probates and Letters of Administration (Ireland).
96. ——— Glebe Lands (Ireland).
97. ——— East Quay Wall Tax (Dublin).

PATENT LAW AMENDMENT ACT.

APPLICATIONS FOR PATENTS AND PROTECTION ALLOWED.

[*From Gazette, June* 26.]

Dated 5*th March*, 1857.

650. Thomas Jefferson Thompson, Greenwood-park, Newry, county Down, Ireland—Improvements in the construction of gasometers, whereby they are rendered applicable to lighting railway carriages.

Dated 6*th April*, 1857.

964. John Slack, Manchester—Improvements in lubricating certain parts of looms for weaving.

Dated 28*th April*, 1857.

1200. David Chadwick, Salford, and Herbert Frost, Manchester—Improvements in apparatus for measuring water and other liquids and gas, applicable also to the purposes of obtaining motive power.

Dated 6*th March*, 1857.

1286. Peter Armand le Comte de Fontainemoreau, London, Paris, and Brussels—Improvements in the preservation of grain and alimentary substances in general. (A communication.)

Dated 12*th May*, 1857.

1342. William Massey and John Smith, Newport, Salop—Improvements in machinery for ploughing and cultivating land.

Dated 15*th May*, 1857.

1376. Henry Schmidt, 82, Rue St. Honoré, Paris—A new apparatus for advertising in railway carriages, omnibuses, cabriolets, and other vehicles, and in theatres and public places.

Dated 16*th May*, 1857.

1386. Henry Jones, Birmingham—An improvement or improvements in engines for raising beer and other liquids.

1388. George Henry Creswell, Devonport—Improvements in apparatus for supplying ink or other mixture for stamps used in stamping letters and other articles.

1390. Charles Cowper, 20, Southampton-buildings, Chancery-lane—Improvements in preparing solutions and extracts of the colouring matter of madder and other tinctorial substances for dyeing and printing. (A communication.)

1392. William Hill, Carlisle—Improvements in railway brakes.

Dated 18*th May*, 1857.

1394. Rudolph Bodmer, 2, Thavies inn, Holborn—Improvements in locomotive steam engines. (A commnnication.)

1396. Isaac Louis Pulvermacher, Paris—Improvements in pipes or tubes for smoking.

1398. James Apperly and William Clissold, Dudbridge, Gloucester—An improvement in carding engines, and in condensers applicable thereto.

Dated 19*th May*, 1857.

1402. Thomas Welcome Roys, Southampton—Improvements applicable to explosive shells.

1404. Edward Alfred Cowper, Great George-street, Westminster—Improvements in furnaces for heating air and other elastic fluids.

1406. John Hope, Bishops Auckland, Durham—An improved screw nut and ratchet brace for working the same.

1408. Jacob Ulrich Ott, Zell, Zurich, Switzerland, and Friedrich August Moritz Udloff, 12, Somers-town—Improvements in ruling paper, and in the pens or instruments for the same.

1410. Maria Bounsall Rowland, Acton Green—Improvements in soap and detergent preparations or compounds.

Dated 20*th May*, 1857.

1412. Charles Weightman Harrison, Woolwich, Kent—Improvements in obtaining light by electricity.

1414. Abel Foulkes, Chester—Improvements in sewing or pointing gloves, and in machinery for such purposes.

1416. Alfred Austin Usher, Birmingham—A new or improved moderator lamp.

1420. Laurent Lethuillier, 67, Rue Marbeuf, Paris—An improved machine for moulding and compressing bricks, tiles, and other articles made of soft materials.

1422. John Harrison, 25, New Church-road, South Hackney—Improvements in railway signals.

1424. Joseph Jakens, Bury—Improvements applicable to printing and dyeing woven fabrics and fibrous materials.

1426. William Stettinius Clark, 133, High Holborn—Improvements in machines for cleaning and polishing knives. (A communication.)

1428. Edward Curtis Kemp, Avon-place, Pershore-road, Birmingham—Improvements in chandelier or other pendent gas-lights, and in the fittings for the same.

Dated 21*st May*, 1857.

1430. James Hopkins, St. George's-in-the-East, and George Pearce, Mile-end—Improvements in trucks.

1432. William Owen, Ardwick, near Manchester—Improvements in machinery or apparatus for stretching woven fabrics.

1434. William Todd, Heywood, Lancashire—Certain improvements in the treatment of yarns or threads, and in the apparatus for performing the same.

1436. William Beech, Burslem, Staffordshire—Improvements in generating and applying motive power.

Dated 22*nd May*, 1857.

1440. Meyer Drukker, 47, London-wall—Improvements in apparatus for indicating the passage of time.

1446. John Turner Wright, and Edwin Payton Wright, Birmingham—A new or improved manufacture of cloths or coverings for railway trucks and other vehicles, ricks, and other such like purposes.

1448. Benjamin Hornbuckle Hine, and William Onion, Nottingham—Improvements in knitting machinery for the manufacture of ribbed fabrics.

1450. Samuel Fox, Deepcar Works, Sheffield—An improvement in the manufacture of flat steel wire, used for the manufacture of the ribs and stretchers of umbrellas and parasols.

1452. Anton de Schuttenbach, St. Petersburg—Improvements in preparing fatty matters for the manufacture of candles and other purposes.

Dated 23*rd May*, 1857.

1454. Noel Joseph Hyppolite Duplais, 39, Rue de l'Echiquier, Paris—Certain improvements in the manufacture of felt hats and bonnets.

1456. Edwin Travis, Oldham, and Joseph Louis Casartelli, Manchester—An improved apparatus for regulating the supply and discharge of steam, air, water, and other fluids.

1458. Thomas Humphrey Roberts, Plymouth—Machinery or apparatus for cleaning the inside of casks and puncheons.

1460. Gautier Olivier de la Barre, Great Titchfield-street, Cavendish-square—Improvements in obtaining and applying motive power. (A communication.)

Dated 25*th May*, 1857.

1472. Henry Whatley Tyler, 12, Norfolk-crescent, Hyde-park—Improvements in the permanent way of railways.

1474. Richard Archibald Brooman, 166, Fleet-street—Improvements in pumps. (A communication.)

1476. John Earnshaw, junr., Ossett, near Wakefield, Yorkshire—Improvements in the toothed coverings of rag machine cylinders, and in the machinery or apparatus for preparing the same.

1478. William Scott Underhill, Newport, Salop—Certain improvements in wringing machines.

1480. Robert James Hendrie, junr., Blossom-street, Norton Folgate—An improvement in steam boiler and other furnaces.

Dated 27*th May*, 1857.

1483. Charles David Davies, Holloway—Improvements in the application of coir or cocoa-nut fibre as a substitute for hair in the manufacture of cloths used in seed crushing.

Dated 9*th June*, 1857.

1605. William Wright, Fore-street, Newcastle-on-Tyne—Improvements in apparatus for annealing glass in ovens.

1607. John Robertson, Valley Field, Mid-Lothian, N.B.—Improvements in machinery or apparatus for treating or preparing and boiling rags and other materials.

1609. Joseph Henry Tuck, Pall-mall—Improvements in the application of light to facilitate operations under water.

1611. Peter Armand le Comte de Fontainemoreau, 39, Rue de l'Echiquier, Paris—Improvements in the construction of axle bearings. (A communication.)

1613. Richard Archibald Brooman, 166, Fleet-street—Improvements in furnaces. (A communication.)

1615. William Edward Newton, 66, Chancery-lane—An improved life-boat. (A communication.)

1619. Joseph Augustus Burdon, 39, Rue de l'Echiquier, Paris—Certain improvements in apparatus for producing expansion in steam and other motive power engines.

1621. Thomas Daniel, Darley Mills, near Derby—Improvements in drawing frames.

WEEKLY LIST OF PATENTS SEALED.

June 26*th*.

3067. Frederick Wm. Campin.
3076. George White.
3083. John Cheesman Wagstaff.
3085. Joseph Morel.
3087. Horace Vaughn.
3088. Joseph H. George Wells.
8. Frederick Ayckbourn.
292. John Mayo Worrall.

June 30*th*.

2895. William Stettinius Clark.
3053. Giuseppe Antonio Giovanni Nani.
1. John Talbot Pitman.
7. Frederick Herbert Maberly.
9. Frederic Sarley Stott.
11. William Henry Phillips.
25. James Harris.
28. Leonard William Watkins.
32. Rd. Archibald Brooman.
52. Rd. Archibald Brooman.
54. Matthew Trattles.
58. James Morris.
63. George Pate Cooper.
67. Edward Joseph Hughes.
68. James Harris.
76. John Rock Day and Joseph Lester Hinks.
79. John Henry Johnson.
85. Louis Julien Brethon.
94. William Watt.
122. George Parker and William Martin.
126. Francis Watkins.
144. Peter Walker.
154. John Haswell.
162. William Edward Newton.
172. John Henry Johnson.
185. Henry Cater.
452. Joseph Quick, junr., and Alexander Fraser.
501. Joseph Glover and John Bold.
641. William Muir.
947. Emile Testelin.

PATENTS ON WHICH THE STAMP DUTY OF £50 HAS BEEN PAID.

June 22*nd*.

1401. Reuben Bottomley, David Schofield, and Henry Spencer.

June 23*rd*.

1410. William Yates.

June 25*th*.

1425. Theophile Schlœsing.
1431. Edward Joseph Hughes.
1500. Henry Richard Cottam.

June 26*th*.

1429. Thomas Markland.
1467. Thomas Elliott.

Journal of the Society of Arts.

FRIDAY, JULY 10, 1857.

THE DECIMAL QUESTION.

The Council have determined to hold a General Meeting of the Society for the discussion of this subject on Wednesday evening, the 22nd instant, at 8 o'clock.

Thomas Weguelin, Esq., M.P., will preside.

The Discussion will be taken on the following points:—

1st. Whether the use of Decimal Notation should be extended?

2nd. Whether it should include monies, and if so what should be the unit?

3rd. Whether it should be extended so as to embrace weights and measures, and if so what should be the respective units?

ART TREASURES EXHIBITION.

The Committee for organising the visit to the Exhibition at Manchester met yesterday, Wm. Brown, Esq., M.P., in the chair. The period fixed for the Society's visit is the week commencing Monday, the 3rd of August.

The Local Committee at Manchester have made the following arrangements:—

A reception-room will be provided for the members of the Society of Arts, where proper officers will be in attendance to give information, and where communications may be addressed on and after the 27th July.

Permission has been granted for the members to visit the following warehouses, works, &c., during the week of the visit on showing their cards of membership:—

Warehouses.—S. Fletcher, Son, and Co., Manchester; J. and N. Philips and Co., Manchester; John Pender and Co., Manchester; S. and J. Watts and Co., Manchester.

Iron Works, &c.—Edward T. Bellhouse and Co., Manchester; Wm. Fairbairn and Sons, Manchester; P. Fairbairn and Co., Leeds; Mather and Platt, Manchester; James Nasmyth and Co., Patricroft, Manchester; Parr, Curtis, and Co., Manchester; Peel, Williams, and Peel, Manchester; Platt (Brothers) and Co., Oldham; Joseph Whitworth and Co., Manchester; Richmond and Chandler, Agricultural Implement Works, Manchester; James Walton and Co., Cardmakers, Denton.

Glass Works.—Percival Yates Vickers, Manchester.

Mills and Manufactories.—Jas. Akroyd and Sons, (Worsteds, &c.), Halifax; Armitage and Ward, Manchester; Sir E. Armitage and Sons (Cotton), Manchester; Thomas Hoyle and Co., Mayfield Print Works, Manchester; Thomas Houldsworth and Co. (Cotton), Manchester; Marshall and Co. (Flax), Leeds; Oxford-road Twist Company (Cotton), Manchester; Samuel Radcliffe and Sons (Cotton), Rochdale; Titus Salt and Co. (Worsteds, &c.), Saltaire, Bradford; Seedley Printing Company, Manchester; Richard Sykes, Bleach Works, Stockport.

Permission has also been received to visit the following Institutions:—

Royal Exchange (Reading Room). Royal Infirmary. Ragged Industrial Reformatory School. Athenæum (Reading Room). Mechanics' Institution. Chetham's Library. Free Library. Peel-park Museum and Library. Manchester Corporation Water Works.

It is to be distinctly understood that the members have not permission to visit works where a manufacture is carried on of similar character to any in which they may be engaged or may be personally interested.

The members are also invited to a *soirée* at the Royal Institution, Manchester.

It is proposed that the members and their friends should dine together on one day during the visit. Endeavours will be made to obtain economical railway facilities.

As in the case of the visit to Paris, persons duly proposed for membership will, though not actually elected, be admitted to all the privileges of the Manchester visit.

Members intending to join in this visit are requested to communicate AT ONCE with the Secretary, in order that the number going may be ascertained, and the Cards of Membership forwarded.

Members will have the privilege of introducing two friends, either ladies or gentlemen, to to join the party, to whom cards will also be issued on the application of a member.

ON THE HÆMANTLION, AN INSTRUMENT TO FACILITATE THE EXAMINATION OF THE BLOOD IN DISEASE.

By Horace Dobell, M.D., Licentiate of the Royal College of Physicians, &c.

In attempting a systematic observation of the microscopic characters of the blood in disease, several serious difficulties present themselves.

1. There is no means of obtaining blood without inflicting pain.

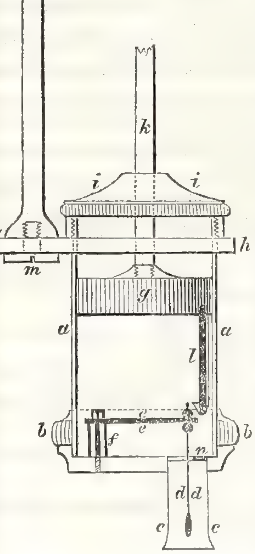
2. Venesection is seldom either necessary or desirable in the large majority of diseases.

3. Blood from a vein, when obtained, does not present the best specimen of the circulating fluid, and its physical characters change before the operation of venesection can be concluded, and the blood placed under a microscope.

4. Obtaining blood from the capillaries, by running a needle into the flesh, is attended with considerable pain, if inserted deep enough to ensure bleeding, and when thus obtained, the blood, having oozed out slowly through a fine orifice, consists principally of serum, the colourless corpuscles being especially deficient.

These difficulties have not presented themselves to me alone, but have been the principal, if not the only, cause for the poverty of knowledge on a subject of such interest as the microscopic characters of the blood in diseases.

I have removed these hindrances from my own way by contriving the little instrument, which I am about to describe to the Society, in the hope that it may be useful to others as well as myself. By it a drop of capillary blood may be obtained in a moment, without pain, as easily as we can feel the pulse, or look at the tongue.



Description of Figure.

A, a cylinder having a solid base, *b*, perforated at *n*, so as to communicate at that point only with *c*, a small glass receiver.

G, a piston to the cylinder *a*, worked by a rod *k*, which is four-sided, and moves in a four-sided aperture in *i*, to prevent its turning round, and having a ring at the end for the finger.

Attached to the piston is a slender rod *l*, having a spring trigger at its end, and descending through *n*, into the receiver *c*, when the piston is thrust down.

A spring, *e*, is connected with the needle *d*, which passes through the solid base of the large cylinder into the receiver below.

The needle, *d*, is so shaped at the point, that it shall cut an opening into the cuticle sufficiently wide to allow the blood, in its natural proportions of corpuscles and serum, to gush through, and is not long enough to reach the surface of the flesh until discharged by the trigger.

A pistol-shaped handle is attached to the cylinder at *h, m, h*.

In using the instrument the orifice of the receiver is placed upon the skin of the patient, the upper arm being the most convenient place. The piston rod is raised by the finger in the ring, and thus the receiver is sufficiently exhausted to draw the flesh up into its cavity. As the piston rises, the trigger, at the end of the slender rod, catches the spring and raises it, and with it the needle. The moment the piston has reached the top of the cylinder, the flesh being well up in the receiver, charged with blood, and insensible to pain, the spring slips from the trigger and the needle is instantaneously darted into the flesh and withdrawn by the recoil of the spring, a drop of blood starting at the same moment to the surface.

The instrument can at pleasure be fitted with a needle having a wider cutting surface, by which several drops of blood may be obtained for *chemical* examination.

For the skill with which he has carried out my design, I am indebted to Mr. Kiessler, who is now engaged in constructing the instrument for Messrs. Ferguson, of Giltspur-street, Smithfield.

DECAY OF GUTTA PERCHA.

Under this heading at p. 264 of the present volume of the *Journal* are given two reports of Mr. E. Highton, communicating the result of his investigations on this important subject. The following further report has been made by that gentleman to the Directors of the British Telegraph Company :—

With reference to my experiments on the action of the mycellium of a fungus on gutta percha, I have for some months been growing one of the class called *agaricus campestris* in contact with gutta percha.

I find as the result that the mycellium of this fungus does rapidly destroy the insulating properties of gutta percha ; and in fact it appears to decompose entirely this vegetable gum. I send a sample shewing the decay.

I am trying further experiments, an account of which I hope ere long to lay before the Board.

A few days ago I examined a spot near Canterbury, where the gutta percha of the wires had entirely decayed.

The soil was pure, clean, sharp, red sand, and there appeared nothing in such soil to induce decomposition.

But at that spot I found a young oak tree, which could only derive its nourishment from the ground through which the wires passed. And upon these roots, both living and dead, I found what I believe to be the mycellium of a fungus, the same as that which I discovered under the oak trees at Berkhampstead.

I send with this some of those roots upon which the fungus can be distinctly traced. The odour arising from that fungus appears to be identically the same as that from the fungi at Berkhampstead.

Ten yards distant was also another young oak tree, and at that point the gutta percha of the wires had also decayed. I will again communicate with the Board when I have made further investigations, but at present I feel bound to say, that the presence of the mycellium of a fungus, and the decaying of the gutta percha covering of the telegraphic wire, being so constantly associated together, I can come to no other conclusion than this, viz :—that the mycellium of a fungus will cause decomposition in gutta percha and probably in most other vegetable productions.

GALVANIZED IRON AND BUILDING STONE.

Sir Charles Barry has addressed the following letter to the *Times* on these subjects, in reference to the new Houses of Parliament :—

"Public attention having, by a recent discussion in Parliament, been directed to the condition of the iron roofs and the stone of the New Palace at Westminster, the following information respecting them may not be unacceptable to your readers, and may serve to remove any misapprehension that may exist on the subject.

"Metal roofs were not contemplated in the original design. They were resorted to upon the adoption by the Government of Dr. Reid's plans for warming, ventilating, &c., by which they were required to contain, as they now do, the main smoke flues of the building, and therefore it became necessary that they should be constructed entirely of fireproof materials. A coating of zinc in preference to paint for the external plates was adopted, upon the strongest testimonials from the French Government and other sources as to its long and successful use in France, where it still continues to be employed extensively, particularly in the dockyards of that country. Since its adoption at the New Palace at Westminster it has also been extensively used both in public and private works in this country, and is still being used by the Government in our own dockyards. Experience, however, has proved that it is not capable of offering a long resistance to the deleterious effects of a smoky and impure atmosphere, and the roofs of the New Palace at Westminster have consequently become partially covered with an oxide of iron, or rust. As regards their stability and weather-proof qualities, however, they are none the worse on that account. No difficulty, moreover, exists in resisting all further oxidation, by covering them with one of the anti-oxide compositions now in use, which may be done at a very moderate cost. Several of these compositions have been in course of trial in various parts of the roofs for some time past, and I have reason to believe that I have discovered one that may be said to be almost imperishable.

"The choice of the stone adopted was the result of the labours of a commission consisting of two of the most eminent geologists of the day, an intelligent mason, and the architect, who in the year 1838 visited every quarry and locality in the kingdom likely to furnish building stone. The stone at Anston, in Yorkshire, was selected and adopted by the Government, and every precaution has been taken to supply from the best beds in it. Upon the whole, it has turned out to be at least as good as any stone hitherto employed in London ; portions of it, in particular situations, and under peculiar conditions, have doubtless yielded to the deleterious effects of a London atmosphere, but the proportion of the parts affected to those which are perfectly sound is infinitesimally small, and it is remarkable that the decomposition is almost exclusively confined to the plain faces, the moulded and carved portions of the work being generally as sharp and perfect as when first executed. To say, therefore, as has been recklessly asserted, that the stone is perishing in all directions, conveys a most unfair and exaggerated impression relative to its accurate condition. Various economical means, however, are available for arresting all further decomposition of the parts affected, and experiments have been in course of trial for years, with a view to determine upon the most effectual and unobjectionable process to be employed, and it is hoped, therefore, that ere long all further decomposition will be successfully arrested."

DECIMAL MEASURES.

On the second day's meeting of the Mechanical Engineers at Manchester on Thursday week, a paper was read by Mr. Joseph Whitworth, "On a standard decimal measure of length for mechanical engineering work." The paper commenced by showing that a general desire is now expressed for some simpler method of measuring and computing than has hitherto been the rule in mechanics and engineering. The fractional system did very well in the old and cumbrous modes pursued by mechanics; but a change to some certain and easy system of measurement and notation was now an absolute necessity. A decimal system was that now proposed by the author for both measurement and notation, the inch being taken as the unit and divided into thousands. A workman would very soon learn to think in tens, hundreds, and thousands, instead of the present mode of computing sizes, thus securing greater safety in all kinds of work which are dependent on accuracy of size, as the manufacture of guns and warlike instruments; and much greater accuracy in all descriptions of work. After showing other advantages to be derived by the general adoption of a decimal system of measure in all engineering and mechanical works and establishments, and proposing that the present measure, or rule of eighths, be abandoned for a rule in thousandths, the paper concluded by showing, from tables exhibited, the nature of the decimal system proposed. Mr. Whitworth then showed several metal specimens of external and internal guages and sizes, arranged to a nicety, equal to 1-5,000ths of an inch, on the system proposed. An interesting discussion followed the reading of the paper, in which several gentlemen took part. Some were for adopting the plan immediately, others for appointing a committee to investigate the matter, or to report upon the best plan of carrying the method into practice. It was ultimately moved by Mr. Fairbairn, seconded by Mr. M'Connell, and (with one exception) carried unanimously, that the meeting pledged itself to the scale of one inch, and that it should be divided into 1,000 parts.

NEW FURNACE.

At the meeting of the Mechanical Engineers, held last week at Birmingham, a paper was read by Mr. C. W. Siemens, "On a new construction of furnace, particularly applicable where intense heat is required." The furnace, as at present constructed, is applied to the melting of metals. A number of zigzag passages are formed of fire brick. There are two fires, and the draught from each passes alternately along these heated passages. So nearly is the heat absorbed, that what ultimately escapes up the chimney is only at about 200 to 300 degrees Fah. It had been used for about three months in a furnace for iron and steel, and the result showed a saving of 79 per cent. as compared with the old furnace, turning out the same quantity of metal.—Mr. Atkinson, of Sheffield, observed that they had one of those furnaces, and found the consumption to be so small that he had the particulars noted during six days, of twenty-four hours per day. The consumption was 1 ton 10 cwt., while the consumption for the same period by the old furnace was 7 tons; each furnace doing the same description of work. The furnace had been applied to the melting of cast steel with favourable results. The average for melting steel was generally 5 tons of coal to 1 ton of steel, but with this furnace they melted a ton of steel with considerably less than a ton of coal. Besides this, there was no smoke whatever; and if this furnace became general in Sheffield, of which he had no doubt, they would be in a position to vie with any atmosphere in the world. In answer to a question as to whether the changing of the currents in the regenerator—thus letting in cold air upon them after they had become highly heated—did not damage the brickwork, Mr. Siemens explained that in each case the cold air came first against the part least heated, then against the next, taking up one hundred or two hundred degrees at each stage, and on this account no cracking from contraction took place.—Mr. Fenton wished to know how iron could be improved by this plan?—Mr. Siemens replied that the puddling had not been long tried, but he thought it might arise in this way: In the ordinary furnace there was a violent draught, but in this the draught was small, and the flame did not cut the iron; it gave an intense heat, with a comparatively quiet atmosphere, thus less oxide of iron was produced. The iron must also be more pure, because fewer particles were carried over to it from the fire. After some further observations, several gentlemen expressed a hope that as the matter was a subject of such vast importance to all in the iron trade as well as to those who used iron, Mr. Siemens would take an early opportunity of furnishing further particulars.

EXAMINATIONS BY THE ROYAL DUBLIN SOCIETY.

The Royal Dublin Society has resolved to hold public examinations at stated periods, in its House, Kildare Street, Dublin, with the view of affording to persons desirous of procuring Commercial, Manufacturing, or Agricultural Situations, an opportunity of obtaining authentic testimonials of their qualifications; and it proposes to confer on deserving Candidates General and Special Certificates of Merit, according to certain regulations of which the following are some of the principal. In order to obtain a General Certificate, Candidates will be required to answer in the first two and any one of the remaining General Courses, viz. 1. Writing and Composition; 2. Arithmetic; 3. Mensuration; 4. Geometry; 5. Algebra and Plane Trigonometry; 6. English History; 7. Geography. Candidates who shall have obtained the Society's General Certificate may, on sufficient answering, obtain Special Certificates of Merit in subjects connected with—Commercial Pursuits, Manufacturing Pursuits, Agricultural Pursuits, Horticultural Pursuits. Candidates for the Commercial Certificate will be examined in Book-keeping, English History, and Geography. Candidates for the Manufactures Certificate will be examined in Mensuration, Mechanics and Hydrostatics, and Chemistry. Candidates for the Agricultural Certificate will be examined in Chemistry, Animal Physiology and Zoology, Geology, and Theory and Practice of Agriculture. Candidates for the Horticultural Certificate will be examined in Mensuration, Botany, and Theory and Practice of Horticulture. Candidates in Chemistry will be examined as to the meaning and use of Chemical Symbols, in the Chemistry of the Metalloids and of the chief Metals with reference particularly to the following Trades and Manufactures, viz., Metallurgy of Lead, Iron and Copper, Dyeing, Soap boiling, Bleaching, Tanning, Pottery, Brick making, Manufacture of Gas, of Sulphuric Acid, and of Soda Ash. The following books may be consulted:—Wilson's Chemistry, Gregory's Chemistry, Fownes' Chemistry, Elementary Chemistry by Scoffern. In Physiology and Zoology, the general principles of Animal Phisiology and Classification of Animals will form the chief subject of examination; and from Candidates for the Agricultural Certificate a practical knowledge of the most important facts concerning the Horse, Ox, Pig, and Sheep will be required. The following books may be consulted:—School Zoology, by Patterson, Agassiz and Gould's Physiology. In Botany, the examination will embrace only the leading principles of Vegetable Physiology and the Classification of Plants. From Candidates seeking the Horticultural Certificate a practical knowledge of the most usual Garden Plants will be required. The following books may be consulted:—Lindley's School Botany, Henslow's Principles of Botany, Outlines of Botany, by Balfour. In Geology, Candidates will be examined in the general principles of the science; their practical knowledge of Rock specimens and of the common Ores of the useful Metals will be tested; a knowledge of a few of the characteristic fossils will be required; and the examination will also embrace a few of the most important of the applications of Geology to Agriculture, Road Making, Quarrying and Mining Operations. The following books may be consulted:—Introductory Text-book to Geology, by Page, Advanced Text-book, Richardson's Geology and Palæontology. In Agriculture, Candidates will be examined as to their knowledge of the structure and constituents of Farm Plants, the nature and constitution of Soils, the nature and value of Farmyard and Artificial Manures. They will also be required to exhibit a general acquaintance with Farm Practice, such as the nature and use of Agricultural Implements and Machines, the Fencing, Draining, and Valuation of Land; the construction of Farm Buildings; the Culture and Rotation of Farm Crops; the Diseases of Cattle and their Treatment, together with the general management of Live Stock. The following books may be consulted:—Johnston's Agricultural Chemistry, Morton's Cyclopædia of Agriculture, Stephens' Book of the Farm, Rham's Dictionary of the Farm, Agricultural Engineering. In Horticulture, Candidates will be examined in the Natural History of Edible Fruits and Culinary Vegetables, and their varieties; the principles of Vegetable Physiology, especially in their application to the several Horticultural operations of Grafting, Budding, Pruning, Transplanting, Hybridising, &c.; the construction and management of Hot-houses, Stores, &c.; the practice of Floriculture. The following books may be consulted:—Lindley's Theory and Practice of Horticulture, Book of the Garden, by M'Intosh, Loudon's Enclyclopædia of Gardening, Niel's Fruit and Flower Garden. Prizes in Money will be awarded to the best answerers. The following classes of persons will not be permitted to attend the Society's Examinations for Certificates of Merit:—1. Persons under 15 years of age. 2. Persons who intend to return to school for the purpose of resuming their education. 3. Persons who either are, or have been, students of a College or University. 4. Certificated Masters of the Board of National Education, or of any other public educational body. The first examination, for General Certificates only, will be held in the Society's House, Kildare-street, Dublin, on Tuesday, 6th of October, 1857, and following days. Candidates will be required to give notice to the Assistant-Secretary, on or before the 1st of September, 1857, of their intention to attend this examination. Printed forms of notice, to be filled up, can be had on application to the Assistant-Secretary. The first examination for awarding Special Certificates will be held in the year 1858, of which due notice will be given.

FREE LIBRARIES.

The Free Libraries Act is to be applied to Walsall. The determination has been come to, in accordance with the terms of the Act of Parliament, at a public meeting of the ratepayers, called, upon a requisition, by the mayor.—After the mayor had explained that the library rate could never exceed one penny in the pound per annum, that none but burgesses could take part in the meeting, and that two-thirds must give their approval before the act could be adopted, Mr. Darwall briefly proposed the adoption of the act, expressing his surprise that any person could be opposed to a measure which could not fail to prove beneficial, and the expense of which must of necessity be so small. The occupier of a £7 house could not possibly be called upon to pay more than 7d. per year for this object, and for this trifling contribution himself, his family, and his friends could have access to a library, reading room, and museum, free of charge. If any persons present objected to it he should be happy to pay their rates for them.—Mr. W. H. Duignan, in seconding the resolution, said the institution proposed would be established by means of subscriptions; the rate was only required to maintain it in existence. He would give £50 towards it, his father would give another £50, and if necessary he would give a further sum of £50. A rate of one penny in the pound would produce £240, but they should not require more than £100 a year for the proposed institution.—The resolution was carried by an overwhelming majority, only half-a-dozen hands being held up against it.—Mr. W. H. Duignan offered, if the persons who had held up their hands against the proposition would come forward, to give them a written obligation to pay the rate for them, but none of them took advantage of the offer.

BRITISH ASSOCIATION FOR THE ADVANCEMENT OF SCIENCE.

The twenty-seventh meeting of the British Association for the Advancement of Science will commence in Dublin, on Wednesday, the 26th of August, 1857, under the direction of the following officers:—

President.—The Rev. H. Lloyd, D.D., D.C.L., F.R.S., L. & E., V.P.R.I.A. *Vice-Presidents.*—The Right Hon. the Lord Mayor; the Provost of Trinity College, Dublin; the Marquis of Kildare; the Lord Talbot de Malahide; the Lord Chief Baron, Dublin; Sir William R. Hamilton, LL.D., F.R.A.S., Astronomer Royal of Ireland; Lieut.-Colonel Larcom, R.E., LL.D., F.R.S.; Richard J. Griffith, LL.D., M.R.I.A., F.R.S.E., F.G.S. *General Secretary.*—Major-General Edward Sabine, R.A., D.C.L., Treas. & V.P.R.S., F.R.A.S., 13, Ashley-place, Victoria-street, London. *Assistant General Secretary.*—John Phillips, Esq., M.A., F.R.S., F.G.S., Reader in Geology in the University of Oxford; Magdalen-bridge, Oxford. *General Treasurer.*—John Taylor, Esq., F.R.S., 6, Queen-street-place, Upper Thames-street, London. *Secretaries for the Meeting at Dublin.*—Lundy E. Foote, Esq., Royal Dublin Society; the Rev. Professor Jellett, Royal Irish Academy; W. Neilson Hancock, LL.D., Statistical Society, Dublin. *Treasurer for the Meeting at Dublin.*—J. H. Orpen, LL.D., 13, South Frederick-street, Dublin.

The general committee will meet on Wednesday, the 26th of August, at one p.m., for the election of sectional officers and the despatch of business usually brought before that body. On this occasion there will be presented the report of the council, embodying their proceedings during the past year. The general committee will meet afterwards by adjournment.

The first general meeting will be held on Wednesday, the 26th of August, at 8 p.m., when the President will deliver an address; the concluding meeting on Wednesday, the 2nd of September, at 3 p.m., when the Association will be adjourned to its next place of meeting.

At the evening meetings, which will take place at 8 p.m., discourses on certain branches of science will be delivered, and opportunity will be afforded for general conversation among the members.

The committees of sections will meet daily, from

Thursday the 27th of August to Wednesday the 2nd of September inclusive, at ten a.m. precisely.

The sections will meet daily, from Thursday the 27th of August to Tuesday the 1st of September inclusive, at 11 a.m. precisely.

The following are the sections to which communications may be presented:—Section A. Mathematics and physics; B. Chemistry and mineralogy, including their applications to agriculture and the arts; C. Geology; D. Zoology and botany, including physiology; E. Geography and ethnology; F. Economic science and statistics; G. Mechanical science.

Notices of communications intended to be read to the Association, accompanied by a statement whether the author will be present at the meeting, may be addressed to John Phillips, Esq., M.A., F.R.S., Assistant-General Secretary, Magdalen Bridge, Oxford; or to Lundy E. Foote, Esq., Rev. Professor Jellett, and Dr. Hancock, Local Secretaries, Dublin.

MONSTER COTTON-SPINNING ESTABLISHMENT IN RUSSIA.

A correspondent, writing from St. Petersburg on the 8th June, says:—

"The first stone of a monster manufactory has just been laid. It will comprise a cotton-spinning establishment and a series of weaving shops. The building is to be raised upon the Isle of Cronholm, situate upon the Narova, between the two cataracts of that river. It is stated that the spinning departments will comprehend the largest building in the whole world, and will immeasurably exceed in extent the vast spinning establishments of the United States. This construction will be formed as a grand square, and will occupy the whole of the isle. A large portion of the adjoining ground has been purchased for the purpose of building habitations for the workmen, and a large school in connection with the great establishment. The contractors for the joinery work are to furnish 1,672 window frames. The building will be lighted by from 15,000 to 20,000 jets of gas. St. Petersburg being unable to supply those materials, from 60 to 80 vessels are constantly employed in the conveyance of them from Narva. The number of workmen engaged is fixed at 3,000 at least. The edifice is to be completed in three years, but a portion of the spinning department is to be ready for work in one year. The capital required for the undertaking has been already subscribed for in shares, which have been taken up by the directors of the scheme and some foreigners. The chief director is M. Jean Frerichs, of Bremen, residing provisionally at St. Petersburg. His associates are the merchants of St. Petersburg, the four brothers Khlondoff, Louis Knoop, Alexander March, and M. Soldatenkoff, merchant of Moscow. Mr. Richard Barlow, an English merchant, is director of the technical works (*travaux techniques*), and Mr. Kolbe, chief administrator of the building, and the framer of the laws of the society.

"The first stone of the colossal edifice was laid with great pomp and circumstance in the presence of the General Baron de Krudener, Commandant of Narva, of all the founding members, and of an enormous assemblage of the people. The first stone was laid by the *prêtre evangelique*, who prayed for the blessing of Heaven to descend upon the undertaking. The second stone was laid in the name of the Government by Baron de Krudener; and M. Soldatenkoff, one of the directors, sealed the gilded metal plate upon which were engraved the names of the founders and the date of the foundation. MM. Alexander March and Kolbe, according to custom, placed several pieces of silver money, struck for the purpose, in a stone hollowed for the purpose.

"A magnificent dinner, to commemorate the event, took place in the evening."

Home Correspondence.

CONFERENCE.

Sir,—Will you kindly insert, in the next number of the *Journal of the Society of Arts*, the accompanying letter, which I have received from the Windsor and Eton Literary Institute?

It refers, as you will see, to a speech reported in your *Journal* to have been made at your last discussion, by Mr. Chamberlain, a delegate from Windsor, and which speech reflects on the Committee of the Bucks and Berks Lecturers' Association, (with which the Windsor Institute is in union), as regards their management both of the Association and Examination. I am, &c.

EDWARD HALE.

Hon. Sec., Bucks and Berks, Lecturers' Assoc.

Eton College, July 3rd.

(Copy.)

Windsor and Eton Literary, Scientific and Mechanics' Institute.

Short-street, Windsor, July 2, 1857.

Rev. Sir,—As Chairman at a special meeting of the Committee of Management of this Institution, held this evening, I beg to inform you, in reply to your letter to the Committee of the 29th of June last, that at such meeting, your letter having been read, it was resolved unanimously,

"That the Committee of the Windsor and Eton Mechanics' Institute do not adopt the opinion expressed in the *Journal of the Society of Arts* attributed to Mr. Chamberlain, which characterises the Bucks and Berks Lecturers' Association as exclusive, and, by implication, calls in question the impartiality of the Examiners appointed by the Association. Mr. Chamberlain himself disclaims the correctness of the report in these particulars, and has offered to give a correct expression of his remarks on the occasion referred to in a letter to the *Journal* above named."

I am, Rev. Sir, your obedient servant,

F. TWINCH, JUN., Chairman.

The Rev. Edward Hale, Hon. Sec.,
Bucks and Berks Lecturers' Association.

Sir,—Allow me to correct a sentence or two in the report of what I said at the late Conference with regard to the Bucks and Berks Lecturers' Association. As the words read, I fear they do, by implication, reflect upon the Examiners appointed by that body; now my argument was directed against the partial composition of the Association itself, and I had no intention at all to call in question the good faith of the gentlemen who act as its examiners; indeed I was not aware at the time that any such had been appointed.

It is but just to the Association to say further, that although its members are chiefly from one class of society, its rules, which have been shown to me, open the door of admission to all who are willing to co-operate in the spread of education; so that the defect in its composition is one which time and success may continually improve. I am, Sir, your's respectfully,

THOMAS CHAMBERLAIN.

July 2nd, 1857.

SOCIETY'S EXAMINATIONS.

Sir,—Not being in the habit of reading your *Journal*, I was surprised and pleased to learn, in perusing the last number, which was kindly lent to me by a friend, that the Society of Arts have a strong predeliction in favour of candidates for examination who shall have acquired their information mainly, if not solely, through the instrumentality of Mechanics' Institutions. I am gratified in learning that fact, because I know that many of the successful competitors, both at the last and previous examinations, were persons who had received a moderately good education before joining the classes, by means of which, they were enabled to attend the Society of Arts examinations. I am one of those plodding self-taught individuals, who know by experience the labour and cost necessary to repair so great a defect as that of a want of early mental training. It is just and generous, and highly politic, that the Society of Arts should give every encouragement to this class of candidates. I do not think the Society should attach much weight to the certificates of the secretaries of Institutions, as to the antecedents of the pupils recommended. Every Institution will be anxious to send as many of its most gifted members to the examinations as possible; and the secretary will not, as a general rule, be instructed to confine his selection to those who have been solely educated at Mechanics' Institutions; nor do I personally wish that such should be the case; I am only anxious that a spirit of fairness should be exercised at these invaluable examinations, which is the wish, I am sure, of those who have instituted them for the good of the community. It is not difficult for a youth fresh from school, where he has served an apprenticeship of several years, to furbish up the knowledge there acquired for the purpose of these examinations. There would seem to be less merit in such a candidate, than in him who foregoes the advantages which time and money will purchase, in order to attain for himself, when arrived at maturity, that mental aliment which has been denied to him at the time it was most needful to prepare him for the battle of life.

In conclusion, I beg to offer to the Society two suggestions; the first is so important as to require their gravest consideration; and the second would, if adopted, make their labours better known and more widely appreciated. My suggestions are that the examinations should take place in the *evening*, and that the *Journal* should, if possible, be published at *twopence*, even though a loss were sustained by the alteration.

I am, &c.,
EDWIN UTLEY.
A Member of the Evening Classes.
Crosby-hall, Bishopsgate, June 29, 1857.

SILK REELING.[*]

Sir,—Presuming that any information relative to improvements in silk-reeling and to their introduction into this country, will be interesting to our Society, I beg to furnish you with some particulars, as a practical supplement to the paper which I had the honour to read before our Society in 1855.

I have since then continued a series of experiments, which have resulted in a system of machinery, producing important and satisfactory considerations. Desirous of having my invention subjected to an earnest and thorough test, I sent a machine to Avignon, the centre of the silk producing districts of France; it has there been in operation about two months, and has been inspected, and with its produce examined, by some of the most eminent French and Italian reelers and merchants, who have unanimously pronounced it to be superior to any reeling machinery hitherto introduced there. They recognise an economy in the raw material alone to exceed 10 per cent., and anticipate a complete revolution therefrom in the production of silk. Negotiations are now in progress for a large introduction of my machinery into France.

The same results having been witnessed here by some reelers from Sardinia, they have, for the purpose of working my system, and under my license, organised at at Novara a very extensive company, named *Setificio Nationale*, (visited and reported on by the *Times* correspondent,) with special authority from the king. They have already ordered a considerable quantity of machinery from this country.

I have at my works here a full-size machine, (the first of a large quantity, which I purpose to have) demonstrating the practicability of reeling silk in this country by children as operatives, instead of by adult and experienced reelers as on the Continent; the employment by means of my machinery being very simple, and free from any excessive or painful fatigue or injury to health. There will be no scarcity of supply of cocoons. I find merchants are as desirous to import silk in that as in any other state.

Should any members of our Society desire to see this new industry in its early but practical commencement, I shall have pleasure in receiving them, and in submitting the operation to the evidence of their own judgment.

I am, &c.,
THOMAS DICKINS.
Middleton, July 1, 1857.

The following is the extract from the *Times*, to which the foregoing letter refers:—

The Silk Trade in Piedmont.—Notwithstanding the very backward state of all agricultural proceedings in consequence of late cold winds, with rain, which succeeded some comparatively mild weather at the beginning of the month, and, although the mulberry trees have hardly yet begun to bud, it is said that many engagements have already been made for cocoons at the rate of 75f. the miria. A great improvement is being introduced here in machinery for winding and spinning silk direct from the cocoons, according to an invention of Mr. Dickens, of Middleton, near Manchester, the machinery for which has been manufactured by Messrs. Gordon and Co., of Stockport. Some of the principal manufacturers in this country speak most favourably of this system, of the working of the machinery, and the superior quality of the silk produced by it. I have lately seen an immense building in course of construction at Novara for the purpose of carrying out this system on a very extensive scale. It is the property of a company presided over by the Cavaliere Rossi, the Syndic of that town, and is so built that, if desired, it can be increased to four times its present size without inconvenience, but even in its existing proportions it will have 12,000 spindles, driven by two 12-horse power condensing engines, and employing between 300 and 400 hands. Mr. Emerson, of the firm of Gordon and Co., is superintending the arrangements for carrying out the building and putting up the machinery, which, it is hoped, will be ready for the coming crop, and which, if successful, is likely to effect a perfect revolution in the silk manufacture of this country. The principal advantages expected from this system are—the power to reel at all seasons any kind of cocoons not positively injured; to reel with lukewarm water; to employ children as operatives; to obtain a more even and elastic thread; a certainty in the minimum of twist required, thereby avoiding excess; the power to disengage or set in motion any one of the spindles and bobbins without stopping the remainder; a greater extraction of silk from the cocoons, and a vast economy in cost of machinery, in wages, in space, and in power.—*Turin correspondent of the Times.*

A REGULAR SUPPLY OF COTTON *VERSUS* FLAX AND HEMP.

Sir,—Is it not as essential to the well-being of thousands that we should have as regular a supply of flax and hemp as cotton?

During the late war, flax and hemp rose in price, in some cases, considerably over one hundred per cent. Many old established flax spinners, unwilling to disperse hands, worked on at a considerable loss to themselves and some to their ruin; thousands of people were reduced to short time with dear provisions, &c. The great decrease in our exports of linen, to the extent of some thousands per year, plainly showed the depressing influence of the high price of the raw material; all this has been borne patiently, and little or no notice has been taken of it. What would have been said had the cotton spinner passed through the same ordeal. The proud position of the cotton manufacturer is not for its superior quality, but from the uniform supply, or nearly so, of the raw material, and a less costly mode of preparation. Could the linen manufacturer get as regular a supply of flax, or any fibre equal to it, and at the same price, calculating every expense of working, as cotton, we should soon find the linen fabric gain the preference. But is there not a possibility of getting a regular supply of a material equal to flax at a cheap rate? I believe there is, if properly investigated; but, like the old saying, "what's every body's business is no one's." Great encouragement has been given at various times by the Society of Arts for the introduction of new fibres, and the Society has been inundated, from time to time, with the most promising samples, and we have thought, for the hundredth time, we should soon be independent of Russia for these important staples; these samples have created a sensation for the time, and have then vanished into the museum of the curious. These failures may be attributed to the want of a practical knowledge of fibres being brought to bear upon the subject, so as to produce them upon a large scale and bring them into the market at a paying price. I do not think that any subject has been more zealously prosecuted with so little real practical science brought to bear upon it. To illustrate my meaning I will state a few facts. A short time ago, a London rope-maker purchased several bales of Himalaya hemp, at, I believe, about £30 per ton; on opening several bales, it was found the hemp was twisted into little lots, about the thickness of a finger, and as tight as the strand of a rope; the hackling of it cost five times as much per cwt. as Russian hemp for the same purpose, and at this price, the workmen could not get a living at it; it was packed up and sold at a public auction, at a loss of 50 per cent.; nearly as much time must have been spent in depreciating it to that extent as in the whole first preparation. The mode of retting hemp in Bombay depreciates its value to at least 40 per cent.; instead of steeping it in water, it is buried in sand or mud by the side of their rivers, thus increasing its weight 14 to 20 lbs. per cwt., not only to the partial ruin of the material, but to the ruin of our poor workmen, owing to the find sand getting into their lungs. In several cases death has ensued from it. It is only by paying the hacklers about three hundred per cent. more than for the Russian hemp for the same work that they can be induced to do it at all. I could name many instances where the want of a practical knowledge renders goods, if not unsaleable, unremunerative, which, if properly treated, would prove valuable staple articles. I will name one more instance, as I think through such hints the error may be corrected.

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[*] See Mr. Dickins' paper on this subject, read before the Society on the 7th Feb., 1855, and printed in the *Journal*, vol. iii, p. 197.

Several bales of pressed-packed flax straw from Australia has been recently sold by public auction in London, realising a very high price, namely, £5 5s. per ton; large quantities are sold in this country, and sold for less than £4 per ton. I merely mention this to show the Australian flax straw must have been of a superior quality to fetch that high price, and yet the whole proceeds of the sale were swallowed up in freight, charges, &c. By the introduction in Australia of some not very expensive scutching machines, which any light unskilled labourers, either male or female, might be taught the use of in a week, about six hands would clean from 30 to 40 cwt. of clear fibre per week; thus, to every six tons of flax straw five tons would be left behind as rubbish; the remaining ton of clear fibre, if of good medium quality, would realise here about £50. Thus, instead of a loss, the introduction of a paying staple article irrespective of the value of the seed would have been the result.

The fibre I should wish more particularly to draw public attention to is the Rheea fibre of India, a species of the China grass. From the little experience I have had of it, I consider it worth more than all the fibres of India put together. It is adapted for general purposes in a most extraordinary degree, from the finest thread to the coarsest canvass and cordage; its strength is unequalled, and it resists wet and damp more than any other fibre, with the exception of the cocoa nut fibre. Now let us examine the difficulty of getting a regular supply of this material. Mr. Henley, who was the first to draw attention to this important fibre in India, says, that by paying each native 2½d. per day, three tons he had prepared and sent to this country, were sold at a loss. Mr. Henley states the stalks will not rot or ret (as it is termed) as flax or hemp, and that the natives operate on each single stalk by breaking it in halves and then stripping off the bark, this mode, no doubt, answering every purpose for the few fishing lines and nets required for their own use. But now there is a demand for tons instead of lbs. The produce of fibre to the acre is most extraordinary, three cuttings per year producing from one to one and a-half tons of clear fibre per acre, flax being only from three to five cwt. per acre.

We come now to the question, cannot British science be brought to bear to clean it at a cheap rate? I believe it can, and if so, it can be produced cheaper than any other fibre. But, irrespective of the Rheea fibre, our various colonies are teeming with fibres. A series of beautiful samples have been sent from Port Natal, one of which is quite equal to Italian hemp, used now by our government in preference to the Russian hemp, also a fine plantain fibre, superior to that from Manilla. It is of no use to have these beautiful samples, if on receiving them in bulk we find them spoilt in preparing or packing, as has been the case with the sample bales recently sent from India. It is high time we were up and stirring in this matter, and should endeavour to see if we cannot be a little more practical, or we shall soon lose our export trade in cordage. Our exports in cordage show an increase, but a large portion of this is of Russian manufacture. Are we getting so rich as a nation that we can afford to despise our lesser manufactures and make it a matter of indifference whether our own people are employed or not, or whether we are only to be the great receiving house for the export of other nations' goods? I visited Russia in 1851, and from what I then saw I could plainly see they would gradually get the export trade of cordage into their own hands. I heard they had only established English rope making machinery about 15 years, and they were then making, in two establishments at St. Petersburgh, nearly as much as all the London ropemakers, the greater part of which was for exportation; and, irrespective of what they send here, they ship direct to all parts of the world. The greater portion of the yarn is spun by the serfs in the country, at a most extraordinarily low price.

But why should even one of our manufactures as an export be lost if it could be prevented? but this is not the worst feature, as was plainly shewn during the last war. The manufacturers of Russian fibres, while so dependent on them for a supply, must always be in jeopardy of being ruined upon the bare rumour of a war with Russia, which I, with hundreds of others, have bitterly experienced. I think it was in 1836 or 37 (I speak from memory), there was then a mere rumour of a war with Russia; hemp went up from £30 to upwards of £40 per ton, shortly after we had taken a large contract requiring a supply of hemp and flax. From a long study of this subject I am quite convinced that this state of things could be entirely remedied, once and for ever, by the application of a little common sense and no very large amount of capital, if honestly carried out in a judicious way. There is sufficient machinery in existence that could be adapted for anything required; it only wants the application. What can be of greater importance to a maritime country like Britain, than a regular and cheap supply of raw material for cordage, canvass, &c., &c., second only, I suppose, to the great cotton supply question. What I should recommend would be simply this, send out one or two practical manufacturers to our colonies, persons of inventive minds, not only acquainted with the retting and scutching flax, but possessed with a thorough knowledge of the various machines for that purpose, and well acquainted with the value and uses of various fibres. A small quantity of machinery might be taken out for experimental purposes, these persons might give instructions in the mode of preparing, sorting, packing, &c., &c. Should these hints from a practical manufacturer, who has for years had opportunities of seeing both sides of the question, and is convinced of the great importance of the subject to the happiness and well-being of thousands, that of getting a regular and cheap supply from our own possessions, not only to compete with Russia but to be independent of her, be acted upon, it would give our manufacturing interest such an impetus as was never known before. Hoping, sir, that something will be done, so that it will not still end in talk, as hitherto, and leaving the subject in your hands, I am, &c., EDWIN WARD TRENT.

Park Hemp Works, Old Ford, June 16, 1857.

Proceedings of Institutions.

Reading.—The members of the Literary, Scientific, and Mechanics' Institution met in their large room on Monday, the 8th of June, for the transaction of the annual business. The attendance was rather larger than usual, and considerable interest was displayed in the welfare and proceedings of the Institution. Dr. Cowan presided. The Honorary Secretary, Mr. Boorne, in the absence of their Treasurer (Mr. Chas. Stephens) read the financial statement, showing a balance in favour of the Institution, on the year 1856-7, of £24 5s. 1d. Mr. Boorne then read the report of the directors, in which it is stated that the Institution, during the sixteen years of its existence, has ministered largely to the general information, intellectual improvement, and rational recreation of all ages and classes, and that at the present time it occupies a place in the town which it could not relinquish without occasioning a blank which would sensibly be felt, if not regretted, by all. It is considered that not only the members, but the inhabitants of the town generally, are indebted to its agency for the means of intellectual improvement and recreation to an extent which few, if any, towns of similar circumstances enjoy. The directors state that the subscriptions of the enrolled members of the Institution do not amount to half of the expenses of the Institution, limited as they are by the utmost watchfulness and economy. The expenses of the past year do not exceed the average of preceding ones, but the regular subscriptions (as was anticipated in last year's report) have fallen off, consequent on the establishment of somewhat similar Institutions in the town. Notwithstanding this result, it is gratifying to the directors to find that the support from other sources has been such as to make the gross receipts for the year cover all expenses, and leave a balance in favour of the Institution of £24 5s. 1d.; and this is the more gratifying when it is considered there has been a gradual progress for several successive years, the balance against the Institution diminishing year by year, and that this is the first year they have had to report so favourable a result as a balance in hand. The directors refer to some of their sources of income which have contributed to their success, and point out that the Fête at Whiteknights Park (so liberally placed at their service by the Baron Goldsmid), whilst affording to the members and their friends a day of innocent recreation and enjoyment, resulted in a profit of no less a sum than £62. With a less pecuniary result, but prompted by a similar spirit of kindness and liberality, the Reading Choral Society placed at the disposal of the Institution the proceeds of their "open night." To the Baron Goldsmid, to the Reading Choral Society, and its conductor, Mr. Dawson, the thanks of the Institution are eminently due; also to T. Hargreaves, Esq., of Arborfield Hall, for a donation of five guineas, which places that gentleman among the Life Governors of the Institution. The corporation having received from the government a grant of their volumes of "Patents and Inventions," and being desirous to give them the fullest publicity, have made this Institution the depository for them, paying the expense of the necessary shelves. These very valuable works are under the care of the librarian, and are accessible to the public. To the library about 100 vols. have been added during the year, and many of the books which stood most in need of it have been rebound. About 50 vols. have been the gift of a gentleman (G. Taylor, Esq.), whose liberality the directors have had to acknowledge in previous years. The number of volumes issued during the year is 3,350. At the present time there are no classes in existence amongst the members, a circumstance regretted by the directors, as they are, when well conducted, the means of considerable self-improvement. During the ensuing winter it is hoped several will be established, towards which the directors will give every encouragement and facility. The lecture list—an important and attractive feature in the operations of the Institution—has, in the variety of the subjects, number of lectures, and the talent and ability of the lecturers, sustained the high character of former years. The lectures have previously (with one slight exception) been an expense in the aggregate to the Institution, and some years have drawn largely on its funds. This year, it will be observed, the receipts have been in excess of the expences, and have contributed £14 to the account of the Institution. Taking into consideration the high character of the great majority of the lectures, and the practice of other Institutions, the directors concluded to alter the charge for admission to non-members from 6d. to 1s., and although the result on the whole justified such alteration, it is their intention to return another winter to the former admission fee to non-members, as they do not regard even this financial advantage as equivalent to the loss of attendance numerically, which cannot but be accompanied in many cases with an unfavourable effect upon the lecturer and the audience. The Lord Bishop of Oxford, the very rev. the Dean of Westminster, and other gentlemen who have lectured gratuitously, have placed the Institution under great obligations, and to them the directors, in the name of the members, tender their most cordial thanks. Mr. Alderman Walford moved, and Mr. W. R. Bartlett seconded, the resolution, "That the report now read be received and adopted," which was carried unanimously. The meeting then proceeded to the election of their officers for the ensuing year, when Mr. Charles Dickens was re-elected president of the Institution, and votes of thanks were passed to Dr. Cowan and the officers.

MEETINGS FOR THE ENSUING WEEK.

Tues. Zoological, 9.
Wed. United Service Inst., 8½. Rev. F. R. A. Glover, Her Majesty's Chaplain at Cologne, "Euclid rendered practically available to the exigencies of Military Service in the uses of the Instrument called the Polymeter."
Fri. United Service Inst., 3. Lieut. D. C. Walker, R.E., "On Military Tactics."

PATENT LAW AMENDMENT ACT.

APPLICATIONS FOR PATENTS AND PROTECTION ALLOWED.

[*From Gazette, July* 3.]

Dated 22nd April, 1857.

1126. James Sharples, Crawshaw Booth, near Rawtenstall, Lancashire—Improvements in drying cotton and other fibrous substances or materials.

Dated 12th May, 1857.

1330. Peter Armand le Comte de Fontainemoreau, London, Paris, and Brussels—An improved hydraulic motor. (A communication.)

Dated 25th May, 1857.

1462. Thomas Bullock, 4, Skinner-place, Holloway—The construction of water-closets upon the principle of self-action and self-cleansing, called the self-cleansing water-closet.
1464. William Robertson, Glasgow—Improvements in pistons, and in apparatus connected therewith.
1466. William Edward Newton, 66, Chancery-lane—Improved counting apparatus, applicable for counting envelopes, cards, printed papers, or other articles that require to be put up in packets or parcels containing fixed numbers. (A communication.)

1468. Alphonse Coutant, Paris—Improvements in forging and rolling iron wheels for railways.
1470. John Crossley, St. Helen's, Lancashire—Improvements in machinery for grinding and smoothing glass, marble, and other substances.
Dated 27*th May*, 1857.
1482. William Hart, Brigg, Lancashire—Improvements in signal lamps.
1484. William Stettinius Clark, 133, High Holborn—Improvements in machines for producing artificial ices from cream and other liquids. (A communication.)
1486. William Stettinius Clark, 133, High Holborn—Improvements in copying presses. (A communication.)
1488. James Sutcliffe, Manchester—Improvements in water-guages.
1490. William Holland, Birmingham—Improvements in umbrellas and parasols.
1492. Henry Crompton, Farnworth, Lancashire—Certain improvements in machinery or apparatus for stretching woven fabrics.
1496. William Sawney, Beverley, Yorkshire—Improvements in winnowing or corn-dressing machines.
1498. Virginie Bacqueville-Pieters, Paris—Improvements in outside blinds or shades for windows, doors, and other places.
1500. Randal Cresswell, Conduit-street, Regent-street—Improvements in grease or lubricating boxes for axles and other rotary parts of machinery.
1502. Richard Archibald Brooman, 166, Fleet-street—Improvements in distilling and in apparatus employed therein. (A communication.)
1504. Louis Joseph Almidor Danne, Caen, France—Manufacturing gutta-percha glue, and applying the said glue to various new purposes.
1508. Edward Paige Griffiths, High-street, Camberwell—Improvements in apparatus for beating the whites of eggs and other fluids and matters.
1510. William Hale, Swan-walk, Chelsea—Improvements in rolling iron and steel.
1512. Alfred Vincent Newton, 66, Chancery-lane—Certain improved apparatus to be used in the manufacture of iron. (A communication.)
Dated 28*th May*, 1857.
1514. Nathaniel Cox, Liverpool—Improvements in railways. (A communication.)
Dated 29*th May*, 1857.
1516. William Wilber, New York, U.S.—Hot-air apparatus for hulling and extracting oils from oleaginous seeds.
1517. Thomas Willis and George Chell, Longsight—Improvements in machinery for spinning, doubling, and winding yarn and thread.
1518. Charles Fleet, Brighton—An improvement or improvements in the manufacture of printing ink. (A communication.)
1520. James Merrylees, Paisley, Renfrew, N.B.—Improvements in the manufacture or production of ornamental fabrics.
Dated 30*th May*, 1857.
1524. William Stettinius Clark, 133, High Holborn—Improvements in machinery for the manufacture of an instrument for sharpening watch cleaning sticks used by watchmakers, said instrument being also applicable to the sharpening of small wooden cylinders for other purposes, such as lead pencils, &c. (A communication.)
1526. Edouard Alexandre, Paris—Improvements in the manufacture of organs and other similar musical instruments.
1528. Dr. Hermann Bleibtreu, Alum Works, near Bonn-on-the-Rhine—A new mode of preparing coke for metallurgical processes.
1530. John James and William Daykin Grimshaw, Southampton—An improved screw propeller for propelling ships or other navigable vessels through water.
1532. Jean Salles, Paris—An improved safety lock.
1534. George Watson Pye and Thomas Oldknow, Nottingham—Improvements in machinery for manufacturing bobbin net or twist lace.
1536. Thomas Sherratt, South-square, Gray's-inn—Improvements in time-keepers.
Dated 1*st June*, 1857.
1540. William Henry Walenn, 68, Chancery-lane—Improvements in the electric deposition of metals and metallic alloys.
1548. Richard Wright, Brighton—Improvements in steam boilers.
Dated 4*th June*, 1857.
1571. Cherie Martel, Boulogne-sur-Mer—An improvement in fire-arms.
Dated 5*th June*, 1857.
1588. James Morris, Clapham—Certain improvements in connecting the rails of railways, and in supporting the same.
Dated 9*th June*, 1857.
1604. John Bickford, Crediton, Devon—Improvements in machinery for cutting gutters for irrigating land and for cutting other surface drains or gutters.
1606. William Wright, Forth-street, Newcastle-on-Tyne—Improvements in apparatus for feeding fires and furnaces with fuel.
1608. Isaac Whitesmith and William Whitesmith, Glasgow, N.B.—Improvements in weaving.
1610. Clement Auguste Kurtz, and Louis Alcide Nori, Paris—Improvements in extracting the colouring matter from gum lac and other similar substances, and in treating the residues thereof.
1614. William Edward Newton, 66, Chancery-lane—An improved arrangement or construction of cut-off gear for steam-engines. (A communication.)
1616. William Edward Newton, 66, Chancery-lane—An improved construction of faucet or cock. (A communication.)
1618. George Mumby, Cloudesley-square, Islington—Improvements in machinery for sewing, embroidering, and other ornamental work.
1620. George Baxter, Northampton-square—Improvements in printing in colours.
Dated 10*th June*, 1857.
1623. James Brown, Aldgate—An improvement in the manufacture of paper.
1624. Joseph Sharp Bailey, Keighley, Yorkshire—Improvements in machinery for combing wool and other fibrous materials.
1625. Griffith Jarrett, London—Improvements in apparatus for printing or endorsing in colours on paper or other surfaces, being improvements upon the invention secured to him by Letters Patent, dated the 29th day of July, 1853.
1626. Maxwell Miller, Glasgow, N.B.—Improvements in cocks, taps, or valves.
1627. William Gorse and Samuel Pollock, Birmingham—New or improved machinery for the manufacture of bricks and other articles of like manufacture.
1628. Thomas Humphrey Roberts, Stonehouse—Improvements in the manufacture of casks.
1629. George Sampson and Joseph Sampson, Bradford, and Elijah Ledger, Lofthouse, near Wakefield—Improvements in means or apparatus for effecting the folding or rigging of woven fabrics.
1630. Arthur Dunn, Dalston—An improvement in preparing and packing tooth powder.
1631. Michael Puddefoot, Queen's-terrace, Woolwich-road, Greenwich—Improvements in mowing machines.
1632. Etienne Lemoine, Paris—Improvements in gas-meters.
1633. Alfred Vincent Newton, 66, Chancery-lane—Improvements in reaping machines. (A communication.)
1634. Alfred Vincent Newton, 66, Chancery-lane—Improvements in the construction and mode of propelling and steering navigable vessels. (A communication.)
1635. William Edward Newton, 66, Chancery-lane—Improvements in printing machinery. (A communication.)
Dated 11*th June*, 1857.
1637. Arthur Folson, Boston, U.S.—Improvements in the construction of tunnels or ways under water.
1638. Daniel Joseph Daly, Tuckey-street, Cork—Improvements in venting casks and in preserving them from bursting by the action of the liquors contained therein.
1639. James Robertson, Glasgow, N.B.—Improvements in lifting, lowering, transporting, and regulating the motion of heavy bodies.
1640. James Shaw and Hugh Shaw, Waterhead Mill, near Oldham—Certain improvements in machinery or apparatus for preparing and spinning cotton and other fibrous substances.
1641. Josiah Latimer Clark, 35, Adelaide-road, Haverstock-hill—Improvements in apparatus for conveying letters or parcels between places by the pressure of air and vacuum.
1643. William Wilkins, Leicester—Improvements in machinery for the manufacture of looped fabrics.
Dated 12*th June*, 1857.
1646. James Buchanan, Glasgow, N.B.—Improvements in the manufacture and finishing of heddles or healds for weaving, parts of which improvements are applicable to the preparing and weaving of fibrous materials.
1647. Thomas Rutter and James Banister, Birmingham—Improvements in umbrellas and parasols.
1649. George Davies, 1, Serle-street, Lincoln's-inn—Improved apparatus for weighing grain and other articles, to be called "the electro-magnetic grain scale." (A communication.)
1650. Benjamin Noakes and Frederic John Wood, Spa-road—A method of, and apparatus to be employed in, the sealing of the joints in metallic casks and other similar vessels.
1651. Edward Brasier, Stepney—Improvements in treating flax, hemp, and other vegetable fibres, and in the machinery employed therein.
1652. Charles d'Ambly, Stuttgart, Wurtemberg—Improvements in cutting and preparing horn. (A communication.)
1653. Carl Gustaf Carleman, 31, Jewin-crescent—Improvements in submerged propellers for propelling vessels.
1654. Malcolm Macdonald, Glasgow, N.B.—Improvements in washing, bleaching, cleansing, and preparing textile fabrics and materials.
1655. Eugène Barsanti and Felix Matteucci, Florence—Improved apparatus for obtaining motive power from gases.
1656. Clarance Brazil, Chorley, Lancashire—Improvements in looms for weaving.
1657. George Lister, Rivers, near Dursley, Gloucestershire—An improvement in carding engines.
Dated 13*th June*, 1857.
1660. Robert Mushet, Coleford, Gloucestershire—Improvements in the manufacture of cast steel.
1662. Chapman March, Alwalton Mills, Huntingdon—Improvements in obtaining motive power.
1663. Etienne Cominal, Paris—Improvements in printing shawls and other tissues.
1664. Thomas Moreton Jones, Cambridge-villas, Fulham—Improvements in apparatus for cutting and gathering fruit and flowers.
1665. Alfred Vincent Newton, 66, Chancery-lane—An improvement in the manufacture of sulphuric acid. (A communication.)
1666. Helmuth Gartner, Mount-gardens, Lambeth—An improved construction of engine for raising and discharging water.

Dated 15*th June*, 1857.

1667. Thomas Heaton, Bolton, Lancashire—Improvements in self-acting doors and gateways.
1668. Charles Vero and James Everitt, Atherstone—Improvements in the manufacture of hats and other coverings for the head, and in machinery or apparatus to be employed in the said manufacture.
1669. John Henry Johnson, 47, Lincoln's-inn-fields—Improvements in quadrants, sextants, and other similar instruments. (A communication.)
1671. William Edward Newton, 66, Chancery-lane—Improvements in puddling iron, and in the furnaces and apparatus employed for the purpose. (A communication.)
1672. Frederick Levick, junr., and John James, Cwm Celyn and Blaina Iron Works, Monmouth—An improved construction of hot blast stove.
1673. Alfred Vincent Newton, 66, Chancery-lane—Improved means of registering the performance of railway trains. (A communication.)
1674. Edmund Thompson, Scawby-with-Sturton, Lincolnshire—Improvements in pianoforte hammers.
1675. William Young, Queen-street, Cheapside—Improvements in lamps and burners.

Dated 16*th June*, 1857.

1677. Thomas Wilkes Lord, Leeds, Yorkshire—A certain improvement in machinery for carding flax, tow, and other fibrous substances.
1679. Stephen Holman, 103, Douglas-street, New-cross—Improvements in force pumps.
1681. William Edward Newton, 66, Chancery-lane—An improved mode of, and apparatus for, feeding in fuel to furnaces and fire boxes. (A communication.)
1683. William Alexander Edwards, Hereford-cottage, Denmark-road, Camberwell—Improvements in apparatus for separating iron and other matters from ores and other substances.
1685. George Tomlinson Bousfield, Loughborough-park, Brixton—Improvements in the construction of wheels and axle boxes. (A communication.)
1687. William Barnard de Blaquiere, 50, Pall-mall—Improvements in connecting the ends of submarine electric telegraph cables.

Dated 17*th June*, 1857.

1689. Philipp Kurten, Cologne, Prussia—An improved process of manufacturing mottled soap.
1695. Frederick Warner, Jewin-crescent, Cripplegate—Improvements in supplying water to water closets and other vessels.
1697. Henry Brinsmead, Fore-street, St. Clements, Ipswich—Improvements in machinery for dressing corn.
1699. Alfred Vincent Newton, 66, Chancery-lane—Improvements in machinery for forging nails and other articles. (A communication.)

Dated 18*th June*, 1857.

1701. George Pemberton Clark, Newark, U.S.—An improved safety-valve for steam boilers.
1703. Thomas Ward, Great Bridge, Staffordshire—An improvement or improvements in the manufacture of strip and hoop iron.
1705. William Joseph Thompson, North Shields—Improvements in machinery for preparing small coal and other matters to be used as fuel. (A communication.)
1707. George Washington Charlwood, 14, Tavistock-row, Covent-garden—Improvements in machines for mowing and reaping. (A communication.)
1709. Horace Hollister Day, New York, U.S.—Improvements in the manufacture of elastic fabrics.

Dated 19*th June*, 1857.

1711. James Champion, Manchester—Improved arrangements of spindles and flyers, applicable to machinery or apparatus for preparing, spinning and doubling fibrous materials.
1713. Thomas Spencer, 21, Southampton-place, Euston-square—Certain improvements in the purification of water, and other fluid and gaseous bodies.
1715. John Henry Johnson, 47, Lincoln's-inn-fields—Improvements in pressure guages. (A communication.)
1717. Horace Hollister Day, New York, U.S.—An improved method of treating or purifying gutta percha. (A communication.)
1719. William Edward Newton, 66, Chancery-lane—Improvements in the construction of railway crossings. (A communication.)

Dated 20*th June*, 1857.

1721. Edward Kirk, James Leadbetter, and Charles Wilson, Leeds—Certain improvements in the manufacture of trunks, boxes, and other similar depositories.
1723. Edward Vincent Gardner, 24, Norfolk-street, Middlesex Hospital—Improvements in the means employed for burning fuel and in the distribution of heat.
1725. Thomas Grahame, Upper Seymour-street, Portman-square—Improvements in facilitating the passage of carriages on inclines of railways.
1727. Henry Dunington, Nottingham—An improvement in the manufacture of cotton and silk and other warp pile fabrics.
1729. Edwin Clark, 20, Great George-street, Westminster, and Joseph Henry Tuck, 22, Pall-mall—Improvements in blocking or supporting ships and other vessels for the purpose of docking them.
1731. Lockington St. Lawrence Bunn, Walbrook—Improvements in the manufacture of Wellington boots.
1733. Thomas Ford Caldicott, Boston, U.S.—Improvements in planes. (A communication.)
1735. William Edward Newton, 66, Chancery-lane—Certain improvements in looms for circular weaving, partly applicable to other purposes. (A communication.)
1737. Charles Fletcher, Gloucester—Improved machinery for making bricks, tiles, and other articles of clay or plastic materials.

Invention protected for Six Months by the Deposit of a Complete Specification.

1795. John Bourne, 9, Billiter-street—An improved steam train for navigating shallow rivers.—26th June, 1857.

WEEKLY LIST OF PATENTS SEALED.

July 3rd.

36. John Ingham, Ed. Ingham, and Benjamin Ingham.
44. François Fréderic Dumarchey, Samuel Levy, and Joseph Mayer.
51. Charles Emilus Wright.
69. Alexander McDonald.
89. James Hodgson.
158. John Bird.
166. Victor Augustin Kientzy.
200. James Garth Marshall.
272. Samuel Montagu.
326. Alfred Vincent Newton.
343. George Wright.
346. Pierre Poisson.
574. David Davies.
657. Francis Alton Calvert.
781. Charles Weiss and Henry Lister.
795. George Perrott.
806. Edmund Hyde.
876. Joseph Scott.
930. Arthur Paget.
949. William Sumner.
960. Charles Burrell.
1032. Henry Adcock.
1105. Thomas Sanderson.
1110. Robert Tindall.
1125. Daniel Colladon.
1150. Rudolph Bodmer.
1174. William Cory.
1175. Rev. James Burrow.
1184. Peter Armand le Comte de Fontainemoreau.
1219. William Edward Newton.
1245. John Marland.

July 7th.

61. William Young Smith.
83. John Bagshaw and John Paine Harris.
84. John and Christopher Gratrix.
86. David Dunne Kyle.
90. Francis Xavier Kukla.
91. Charles Richard Olliffe and James Anning Gollop.
92. John Francis Porter.
95. Rd. Archibald Brooman.
105. John Hinks and George Wells.
113. Robert Russell.
120. Alfred Charles Hobbs.
202. Abraham Hemingway and Thomas Wheatley.
244. Robert Harlow.
245. Charles Whowell.
312. James Taylor.
477. Thomas William Davenport and Samuel Cole.
544. George McCallan.
750. William Edward Newton.
763. John Wilkes, Thos. Wilkes, and Gilbert Wilkes.
1133. John Henry Johnson.
1273. Levi Bissell.
1284. William Edward Newton.
1340. John Richard Cochrane.

Patents on which the Stamp Duty of £50 has been Paid.

July 1st.

1465. Richard Garrett, and Rd. Garrett, junr.
1491. William Pole.

July 2nd.

1469. David Bowlas.
1485. Wm. Newzam Nicholson.

July 3rd.

1464. Joseph Marie Bardet and François Collette.

July 4th.

1484. John Lamb.
1489. James Edward McConnell.
1628. Hughes Champonnois and Jean Baptiste Bavelier.

WEEKLY LIST OF DESIGNS FOR ARTICLES OF UTILITY REGISTERED.

No. in the Register.	Date of Registration.	Title.	Proprietors' Name.	Address.
3999	June 29.	Door for Puddling Furnaces	Edward Yeomans	Kinver, near Stourbridge.
4000	July 2.	The Holford Carriage	Chas. Lenny	Croydon, Surrey.
4001	,, 4.	A Man's Hosiery Under-Waistcoat	Thos. Ashwell and James Hobson Wallis	Nottingham.
4002	,, 7.	Burglary Alarm	Augustin Laybourn	51, Edgeware-road, London.
4003	,, 7.	Lantern for Policemen and Others	Farwig and Bullock	16, Rupert-st., Haymarket, London.
4004	,, 8.	Trap for Rats, Birds, &c.	Collin Pulling	Selsey, Sussex.

Journal of the Society of Arts.

FRIDAY, JULY 17, 1857.

THE DECIMAL QUESTION.

The Council have determined to hold a General Meeting of the Society for the discussion of this subject on Wednesday evening, the 22nd instant, at 8 o'clock.

Thomas Weguelin, Esq., M.P., will preside.

The Discussion will be taken on the following points:—

1st. Whether the use of Decimal Notation should be extended?

2nd. Whether it should include monies, and if so what should be the unit?

3rd. Whether it should be extended so as to embrace weights and measures, and if so what should be the respective units?

ART TREASURES EXHIBITION.

The period fixed for the Society's visit to the Art Treasures Exhibition at Manchester, is the week commencing Monday, the 3rd of August.

Arrangements have been made with the Great Northern Railway to take the members and their friends to Manchester and back, by any trains, *express* or otherwise, on and after the 1st of Aug., at a fare and a-half the double journey, viz., £2 12s. 6d., 1st class; £1 17s. 6d., 2nd class. The tickets to be available for seven days from the date of issue.

The Great Northern will also, if a sufficient number of members express their intention of going, run a special train on Monday, the 3rd of August, for their accommodation; but, to enable this to be done, the members should send in their names to the Secretary of the Society as early as possible.

The members are invited to a *Soirée* at the Royal Institution, Manchester, on the evening of Wednesday, the 5th of August.

Excursions will be arranged to visit some of the distant mills and manufactories.

It is proposed that the members and their friends should dine together on one day during the visit.

As in the case of the visit to Paris, persons duly proposed for membership will, though not actually elected, be admitted to all the privileges of the Manchester visit.

The Local Committee at Manchester have made the following arrangements:—

The Literary and Philosophical Society of Manchester have placed their rooms (George-street) at the disposal of the Society of Arts, where a reception room will be provided for the members, and proper officers will be in attendance to give information, and where communications may be addressed on and after the 27th July.

Permission has been granted for the members to visit the following warehouses, works, &c., during the week of the visit on showing their cards of membership:—

Warehouses.—S. Fletcher, Son, and Co., Manchester; J. and N. Philips and Co., Manchester; John Pender and Co., Manchester; S. and J. Watts and Co., Manchester.

Iron Works, &c.—Edward T. Belhouse and Co., Manchester; Wm. Fairbairn and Sons, Manchester; P. Fairbairn and Co., Leeds; Mather and Platt, Manchester; William Muir and Co., Britannia Works, Manchester; James Nasmyth and Co., Patricroft, Manchester; Parr, Curtis, and Co., Manchester; Peel, Williams, and Peel, Manchester; Platt (Brothers) and Co., Oldham; Sharp, Stewart, and Co., Manchester; Joseph Whitworth and Co., Manchester; Richmond and Chandler, Agricultural Implement Works, Manchester; James Walton and Co., Cardmakers, Denton.

Glass Works.—Percival Yates Vickers, Manchester.

Mills and Manufactories.—Jas. Akroyd and Sons, (Worsteds, &c.), Halifax; Armitage and Ward, Manchester; Sir E. Armitage and Sons (Cotton), Manchester; Thomas Dickins and Co. (Spring Vale Dye Works), Middleton, near Manchester; Thomas Hoyle and Co., Mayfield Print Works, Manchester; Thomas Houldsworth and Co. (Cotton), Manchester; Marshall and Co. (Flax), Leeds; Oxford-road Twist Company (Cotton), Manchester; Samuel Radcliffe and Sons (Cotton), Rochdale; Titus Salt and Co. (Worsteds, &c.), Saltaire, Bradford; Seedley Printing Company, Manchester; Richard Sykes, Bleach Works, Stockport.

Permission has also been received to visit the following Institutions:—

Royal Exchange (Reading Room). Royal Infirmary. Ragged Industrial Reformatory Schools. Athenæum (Reading Room). Mechanics' Institution. Chetham's Library. Free Library. Peel-park Museum and Library. Manchester Corporation Water Works.

It is to be distinctly understood that the members have *not* permission to visit works where a manufacture is carried on of similar character to any in which they may be engaged or may be personally interested.

Members desiring any information respecting accommodation at hotels or lodgings, should apply to Mr. Haden, at the Offices of the Art Treasures Exhibition Committee, 100, Mosley-street, Manchester, with precise information as to the extent of accommodation, and the period for which it is required.

Members intending to join in this visit are requested to communicate AT ONCE with the Secretary, in order that the number going may be ascertained, and the Cards of Membership forwarded.

Members will have the privilege of introducing two friends, either ladies or gentlemen, to join the party, to whom cards will also be issued on the application of a member.

NATIONAL ART COLLECTIONS.

Mr. W. Ewart, in the House of Commons on Monday last, asked the Vice-President of the Board of Education whether, as it appeared from the returns laid before the House, that in the case of some of our national collections of objects of art, science, and historical interest, as well as in the case of civil and religious edifices and monuments (all maintained or assisted by the money-votes of Parliament), the public had the benefit of instruction by means of descriptive labels affixed or appended to such objects, without incurring the cost of a catalogue, while in the case of other such collections, edifices, and monuments (similarly supported by public money) no such advantage was given to the public, measures would be taken for extending the system of labelling generally for the benefit of the public?

Mr. Cowper replied, that the Government had been most anxious to carry out the object to which the hon. gentleman referred in the case of all museums and collections of objects of art, science, and natural products. At the British Museum, at the Kensington Museum, and at other similar institutions, all the articles exhibited were described in a short and condensed manner; and in the case of the Turner Collection, not only were the subjects of the various paintings described, but the date at which they were painted was also given—an arrangement which afforded great assistance to students.

SCOTTISH UNIVERSITIES.

On Monday, a deputation from the Literary Institute of Scotland waited, by appointment, on the Lord Advocate, at his official chambers, Spring-gardens, with the view of urging on his lordship the importance of early legislation on the subject of the extension and elevation of the Scottish universities. The deputation consisted of Alexander Baillie Cochrane, Esq., of Lamington, president of the Institute; Sir James Stuart Menteath, Bart., and Dr. Charles Mackay, vice-presidents; Walter Buchanan, Esq., M.P.; Professor Rankine, Glasgow; Patrick E. Dove, Esq., Edinburgh; Mr. Mitchell, convener of committee; James Dodds, Esq., London; the Rev. Dr. Rogers, Stirling; and William Anderson, Esq., Edinburgh, joint secretary. The following Scottish members of Parliament were present, viz.:—Sir James Anderson, W. E. Baxter, Esq., Charles Cowan, Esq., E. H. Craufurd, Esq., R. Dalglish, Esq., Sir H. R. F. Davie, Bart., F. Dundas, Esq., Hon. Arthur Kinnaird, James Merry, Esq., Colonel Sykes, and Sir Edward Colebrooke. The interview was of the most satisfactory description.

SCIENTIFIC AND LITERARY SOCIETIES BILL.

The following report of what took place in the House of Commons in reference to this Bill, is taken from the *Times*:—

The House went into a committee on this Bill, Mr. Thornely in the chair.

On clause 1 being read,

Mr. Hutt stated that the object of the Bill was to amend the 6th and 7th Victoria, which provided that scientific and literary institutions generally should be exempted from the payment of local rates. From the construction put upon the terms of that statute by various decisions of courts of law, the intentions of its framers had been in a great measure defeated, and the present effect of the Act 6th and 7th Victoria was to benefit literary and scientific societies established by the wealthier classes. He wished by this Bill, which he had introduced at the request of the Society of Arts, to extend the exemption from local taxes to mechanics' institutions, and the humbler class of literary societies which had been established by the spontaneous efforts of the people for their own instruction and improvement. He trusted that, as the object of the measure was to promote popular education, it would receive the sanction of the House.

The clause was agreed to.

On clause 2,

Mr. Spooner moved the omission of the words "science" and "literature," observing, that the exemption of institutions devoted to such purposes from local rates would, in towns where those rates were extremely heavy, increase the burden of taxation thrown upon hard-working mechanics and artisans. He was desirous of limiting the exemption to institutions established for strictly educational purposes.

Mr. W. Ewart supported the clause.

Mr. John Locke supported the amendment, because it tended to narrow the operation of the Bill, to the principle of which he was altogether opposed, on the ground that it was wrong to tax, for the support of institutions of this kind, large numbers of the community who, as in Southwark, which he represented, derived no benefit whatever from them.

Mr. E. P. Bouverie thought it would be hard on the hon. member for Gateshead (Mr. Hutt), after the House had affirmed the principle of the bill, to emasculate it in the way which the amendment proposed to do. He agreed that it was undesirable to carry these exemptions from rating further than they had already gone, but the committee would bear in mind that the exemption sought to be established by this bill was one which already existed in some cases, and that this was only an attempt to apply that exemption to analogous institutions which it was doubtful whether the existing law intended to embrace.

Mr. Puller said, if he had to choose between institutions purely educational and those of a scientific and literary kind so-called, he should elect in favour of Mechanics' Institutions and societies of that kind, which were eminently educational and useful to the humbler orders of the community, and therefore well entitled to the exemption sought to be established by the clause as it stood.

Mr. Beresford-Hope supported the clause as it stood, contending that it was the duty of Parliament, and of all who wished to see the education of the people promoted, rather to stretch a point on the side of mercy and generosity than to seek to impose harsh and unnecessary restrictions on the enfranchisement and development of institutions and societies of the kind contemplated by this bill. He also reminded the committee that, with the divided opinions of the country, a national system of education was impossible, and contended that they ought to fill up the existing gap as well as they could.

Mr. Ridley considered that the Bill was simply a supplementary measure to an existing Act of Parliament, and was only meant to carry out the original intention of that Act on a point which had been ambiguously expressed. He therefore supported the clause as it stood.

Mr. Ayrton supported the amendment, but at the same time objected to the principle of the Bill, holding, as he did, that no house, land, or building, ought to be exempted from rating, unless exclusively used by the whole of the inhabitants within the particular area of rating.

Colonel Sykes supported the clause as it stood, as did also Colonel Thompson, the former on the ground that it was merely explanatory of an existing Act.

Mr. Pease passed an eulogium on literary and mechanics' institutions, and claimed for them every kind of encouragement that the Legislature could extend to them, on the ground that for the last 30 years they had been incalculably useful in educating the humbler orders of the community.

Mr. Palk complained of the loose way in which the clause was drawn, and expressed his apprehension that in some cases it might possibly from that cause have a dangerous or undesirable operation.

Sir W. Jolliffe believed that extremely little benefit would be derived from exemption, because it rendered such institutions unpopular, and in nine cases out of ten merely increased the value of the premises and the amount of rent.

Mr. T. Collins, jun., though favourable to mechanics' institutions, was opposed to exempting them from rates.

The committee then divided upon Mr. Spooner's amendment, and the numbers were—

For the amendment........................	81
Against it..	131
Majority against the amendment	—50

The words "science" and "literature" were therefore retained.

Mr. Bouverie moved the omission of the word "education" in the 14th line of the same clause. He would not have objected to exempt schools for the poor, but the word education was so general that it would exempt establishments of a very different kind.

Mr. Ewart wished to retain the word.

Mr. **Hardy** was opposed to all exemptions, and would support the amendment of the right hon. gentleman. He would move by and by the insertion of the word "exclusively" to test the feeling of the committee, and to ascertain whether they wished to exempt societies, nominally literary and scientific, but in reality enjoying all the luxuries of a London club.

Mr. **Puller** said there was no foundation for the supposition that the words of the clause would exempt such clubs as the Athenæum.

Mr. W. **Miles** suggested the substitution of "elementary or evening schools established for the use of the poor," for the vague term "education."

Mr. **Bouverie** would be very willing to exempt such schools, but he was told it was impossible to bring them under the operation of this Bill, which contemplated societies having rules established for their management.

The committee divided, and there voted—

For the amendment	111
Against it	82
Majority	29

The word "education" was accordingly expunged.

Mr. **Hardy** moved the insertion of the word "fine" before the word "arts."

Mr. **Hutt** opposed the motion, on the ground that while it would exempt from the payment of rates, galleries of painting, and statuary, it would not include institutions established for teaching reading, writing, and arithmetic, and for instructing people in the art of chemistry and all branches of knowledge which might be illustrated by experiments.

Mr. **Palk** supported the motion, and Mr. W. **Ewart** opposed it.

The committee then divided, when the numbers were—

For the motion	97
Against it	96
Majority	1

The word "fine" was consequently inserted.

Mr. **Beresford-Hope** moved the insertion, after the word "arts," of the words "or elementary instruction."

Mr. **Bouverie** said, the committee had already decided that the exemption should not be carried further than at present. He therefore opposed the amendment.

The amendment was negatived without a division.

Mr. **Hardy** moved the insertion of the word "exclusively" after the word "arts." The effect, he said, would be to confine the exemption to those buildings, or parts of buildings, which were devoted exclusively to science, literature, or the fine arts.

Mr. **Hutt** opposed the amendment, which was a mere retention of the existing law.

Mr. **John Locke** was of opinion that some limitation should be imposed.

Mr. W. **Ewart** thought the clause as it stood was sufficiently restrictive, and therefore opposed the amendment.

Mr. **Pease** hoped the House would not assent to an amendment, the effect of which would be to exclude Mechanics' Institutes from the advantages of the Bill. If hon. gentlemen objected to those Institutions, or were opposed to the spread of education by such means, they should say so in terms.

Colonel **Sykes** wished to know whether, if the amendment should be carried, the taking of a newspaper by a Mechanics' Institute would exclude it from the operation of the Bill?

Mr. **Hardy** thought it was unfair that those who objected to the form of this Bill should be denounced as objecting to the spread of education. (Hear, hear.) The amendment was intended only to place the matter in the same position as it was in at present. Without the amendment the clause would only give rise to litigation. With the amendment there would be no difficulty, as the law had been already clearly laid down by the judges.

The Committee then divided, when there appeared,—

For the amendment	114
Against	69
Majority	—45

Mr. **Hutt** said, after the decision of the committee which entirely changed the object of the measure, he did not think it would be of any use to proceed further, and he therefore should move that the chairman report progress. (Hear.)

The **Chairman** accordingly reported progress, and the House resumed.

Home Correspondence.

THE APPLICATION OF SEWAGE IRRIGATION TO CEREAL CROPS.

Sir,—Having been informed, in respect to the growth of the cereals manured with sewage at Rugby, that I have overstated the yield of wheat by one-fifth,—assuming it to be so,—allow me to correct the error, but I think it right to mention that I made the statement as it was made to me by Mr. Walker the owner of the land. I have no doubt the statement would be found to be susceptible of explanation, if he were in this country to give it. I ought indeed to have repeated the statement in the terms, I first gave it, as an "estimate" of the crops then standing on the ground, which estimates are particularly liable to error, and are moreover subject to large deductions, of what has been taken by depredation by birds and others, before the bulk is threshed out. The precision of his statement, as to the progressive increase of the yield of wheat, year after year,—though coincident with other experience, and with the stated experience of the green grass crops, may be affected, as I am informed, it has been, by variations in the quality of the seed used. I wrote to the tenant farmer for the latest information on the subject, but did not receive it, and I allowed it to stand as Mr. Walker had given it to me. I take occasion to add that it was by no means my intention to hold out the farm at Rugby as being in any respect a model of cultivation, (for it is in most respects below other examples to which I have referred), and I have always understood that Mr. Walker himself was far from intending to do so. Indeed he has himself declared that he had been led to spread his distributing apparatus over more than double the extent of land which he deemed necessary; I have mainly adduced it, as one case, proving, with others, the chief sanitary points,—the great absorbent power of the soil itself;—the practicability of pumping sewage upon land three hundred days in the year,—and of applying, immediately, and before decomposition, that liquified manure which under the tubular system of house drains and sewers is removed from beneath the sites of towns before decomposition, which results establish the sanitary case.

Notwithstanding, however, that much of the land at Rugby, as competent authorities will concur, would be improved by drainage, notwithstanding the rudeness and imperfection of the application of the sewage, I apprehend the agricultural case also will be found there on impartial examination, to be fully sustained. The yield of grass under partial dressings, is admitted to be superior to any in the neighbourhood, and there is proof that, such as they are, the owner has fair reason to be satisfied with the economical results. It may be, that under the particular circumstances of that farm as a grazing farm, the tenant may not find the cultivation of the cereals worth his while, not that they would not pay well, but that the green crops will pay better. Nevertheless, if the cost of the imperfect applications of sewage be estimated, a yield of about forty bushels of wheat, in a district where the common yield was stated to me by Mr. Walker, to have been little more than twenty-five bushels, is in nowise to be conceded as a failure.

Apart from this particular instance, I must maintain, however, upon wide experience, the applicability of town sewage to the cereals; and the subject is of so much importance, that I beg to refer to some of the evidence on the question.

For the information of those who may have paid no attention to the subject, which it is to be regretted includes most of those whose duty it is to deal with it administratively, it is proper to state that the fertilising power of the chief matters conveyed in town sewage is by no means undecided as applicable specially to the cereals. Count Gasparin, in treating of the manures proper for them, says "the manures rich in azote stimulate a high production of gluten, and augment the commercial value of the produce. Thus it is established, by the experiments of Dr. Hermstaedt, who, having manured equal spaces of land with manures brought by calculation to a complete state of dessication, found that the yield of wheat contained the following proportions of gluten and starch:"—

		Gluten.		Starch.
1.	Manured with human urine	35.1	...	39.3
2.	,, with human blood	34.2	...	41.3
3.	,, with human excrements	33.1	...	41.4
4.	,, with sheeps' dung.........	22.1	...	42.8
5.	,, with goats' dung...	32.9	...	42.4
7.	,, with pigeons' dung	12.2	...	63.2
8.	,, with cow dung..	12.0	...	66.3
9.	Soil unmanured	9.2	...	66.7

In comparison with these results, I beg leave to cite the authority of Arthur Young, as quoted by Mr. Cuthbert Johnston:—

"It is a vulgar error, says Arthur Young, to imagine that manuring a field with this substance [nightsoil] will give a bad taste to plants. I dressed part of a pasture with it, fed the whole of that year with horses, cows, and young cattle, and I remarked to various gentlemen who saw it, how close into the ground that part was constantly eaten, while there was much longer grass, &c., in every other part of the field. (*Annals of Agriculture*, vol. xxxiii., p. 602.)

"On October 20, 1772, I marked divisions, each of four square perches, on a summer fallow; the soil a poor, blue, pebbly gravel, and manured these compartments as follows:—

	Per Acre.		Produce of wheat Per Acre.	
Soil simple.....................			12½	bushels.
Bushels of night soil.........	320	...	37½	,,
do. do.............	240	...	32½	,,
do. do.............	160	...	31¼	,,
Cubic yards of farm-yard compost	60	...	25	,,
do. do........... .	30	...	23¾	,,
Do. and 1 cubic yard of chalk	30	...	25	,,

"The effects of night soil," he continues, "was prodigious; it just trebles the produce; in all the experiments I have made with this manure, I have ever found this result almost uniform." (*Annals of Agriculture*, vol. III., p. 79.) "It is evident also," says Mr. Cuthbert Johnston, "from Mr. Arthur Young's experiments, which are entirely confirmed by those of the Essex farmers and my own, that night-soil is an excellent manure for potatoes."

The power of the fertilisers in question, as especially applicable to the cereals, confirmed as it is more particularly in Belgium, may be assumed to be established, and the only practical question is as to the best mode of rendering that power available, whether in the solid or in the pulverulent, or in liquified form, diluted, and in solution in water? Now if any one will bring the spongiole of a cereal, or any other plant, in the act of eating, or absorbing food in the pulverulent form, however fine, he will bring forth a curiosity such as, I believe, Professor Brown, or Sir William Hooker, has not yet seen. The results of the trials of the new water drills for drilling in manure with water, as compared with the results of the machines, the dust drills for depositing manure in the pulverulent form, will, when examined on the testimony of the late Mr. Pusey, be found to be decisive. Whilst his yield was only 6½ tons of produce dust-drilled, it was 13½ tons water-drilled, and he sets forth as the advantages of the latter method, "1st, that you can drill in dry weather at once; 2nd, that the manure is better disposed in the soil for each plant to feed upon." The plans for solidifying town sewage may in general be stated as plans for taking out a part of the town sewage, and often not the best part, at a great expense, by chemical precipitants or by evaporation, in order that it may be again put in solution in water for its most productive application. For the sake of many towns where there are no immediately available means for the direct application of the sewage to agricultural production, I should be glad if an economical plan of reducing the town manures to a portable form were found out; but none has yet been established to the satisfaction of the Royal Agricultural Society. It is, moreover, a barrier to the extended use of manures in the solidified or pulverulent form, which has yet to be overcome, that they are only applicable in single dressings,—that they interpose mechanical difficulties in the way of repeated applications of manure to the same crop, whereas in the liquified form the plant may be continually supplied with water as well as food at the same time, according to its varying condition and capacity of feeding. Any one who entertains doubts on the question in relation to the cereals, and who has a field of wheat, may easily determine it for himself, by directing the application of house sewage to a portion of a standing crop: let it be under the advice of a horticulturist or gardener used to the application of liquid manure by means of a watering-pot. Let him next year make the trial by contrasting the results of this method of manuring with any other.

There is, however, further experience on a large scale as to the use of irrigation for the cultivation of cereals, available to those who choose to consult it. Count Gasparin states that, at Cavaillon, (Vaucluse), irrigation, as I presume by the method of infiltration, is applied on a large scale to the cultivation of wheat. He states that the agriculturists there apply four waterings to it—one to the land before sowing the seed, which is in October, a second in April, a third whilst the plant is in blossom, and the fourth some days afterwards. The yield is from 40 to 46 bushels an acre;—the general average yield throughout France being not more than 13 bushels the acre. He adds, "irrigation for wheat is applicable to all soils which, by their constitution, or by deep culture, are permeable to water, and do not retain it near the roots. We have seen it practised in Sicily with great advantage; it is in use in Spain, in Africa, and in America, *i. e.*, in South America. We have no doubt that, with modifications as to the times and numbers of the waterings, the practice may be extended to the north, which also has its years when droughts in the spring are the occasion of sterility." The application of irrigation, not by the method of *submersion*, the only one known in this country, (and which was the one proposed originally for the use of the metropolis, by Mr. Smith, of Deanston), but by the method of *infiltration*—by the distribution of water between ridges of earth, will be found to be of older practice than is commonly supposed. Traces of irrigation works of this species, of extremely remote antiquity, are stated to have been found in the East. It is, indeed, probable that this description of culture is adverted to in the 65th Psalm of David, v. 9—13. "Thou visitest the earth and waterest it; thou greatly enrichest it with the river of God which is full of water; thou preparedst them corn when thou hast so provided for it.

Thou waterest the ridges thereof abundantly; thou settlest the furrows thereof: thou makest it soft with showers, thou blessest the springing thereof. Thou crownest the year with thy goodness, and thy paths drop fulness. They drop upon the pastures of the wilderness, and the little hills rejoice on every side. The pastures are clothed with flocks; the valleys are covered over with corn; they shout for joy, they also sing."

In further justificatory explanation, and, I may add, in illustration of the sort of misrepresentations with which I—or the manure—have been assailed, I beg to refer to a statement publicly made by a member of the Metropolitan Board of Works, that the method of distributing sewage for agricultural production had been tried, at my instance, by the Metropolitan Commissioners of Sewers, the result of which was, "that while the expences amounted to something like £780; the probable receipts were 17s. 10d., no portion of which would ever be available to meet the cost of the drainage of London." These were probably facts, as stated by themselves, and there they were left as telling conclusively by themselves. But amongst the facts omitted were these:—that whilst a steam engine and apparatus of extravagant size and cost for a trial work was obtained, a virulent opposition prevented the application of them to any but a few fields. Amongst the facts omitted to be stated were these also, of results reported by the officers to whom the management of these trial works were entrusted:—In a report by Mr. Douglass, the superintendant of the trial works for applying the sewage, he states "the average quantity per acre applied is stated at 110 tons; the average time of applying the liquid, 1 hour and 5 minutes; cost per acre, labourers 1s. 1d., pumping 7d., total 1s. 8d." Let this be compared with the cost of any other known mode of distribution, and with the understatements which I have made of distribution at a penny and twopence per ton! And now as to the fertilising results,—be it observed of single applications of not more than from one quarter to one tenth of the quantity elsewhere proved to be applicable to the soil.

Mr. John Douglass reports of a farmer, Mr. Attey, "acknowledged to have had £2 10s. worth more hay as extra crop from the effects of liquid manure, which I value at £3, making the half of extra produce £1 10s. This Mr. Attey would not talk about; but said he had no idea he would be called upon to pay anything for the liquid at this time, but would willingly make an agreement to have another application of the liquid as soon as possible, and pay a reasonable price per acre for it, as he highly approved of its fertilising qualities being likely to benefit his farm."

"The wheat crop is very good, and nearly all cut; I did not decide on the valuation, wishing to report and have your opinion. I am of opinion there is at least one sack of wheat and one load of straw per acre extra crop on two acres of land, making two sacks of wheat—say £1 10s. per sack—£3; two loads of straw—say £1 per load—£2. Total value of extra crop from liquid manure £8, half of extra crop £4. I should like to have your opinion on this valuation, as I know I am within the mark of the full value."

Mr. Donaldson, another officer, reported: "The arrangement was, that the value of half the additional crops grown was to be paid for the manure, its effect being, on the dry meadow land, a double crop of grass—and on the corn land, an improvement of something like 30 per cent. on the corn crops. The farmers insist that there should not anything be charged for an experiment on so small a scale: they are anxious now for a supply on a large scale, and are willing to pay for it. The value of additional crop produced by liquid manure, according to my estimate in this instance, varies from 15s. to 47s. an acre."—August 22, 1849.

Nothing was done; nothing could be done by the local representatives, *par excellence*, to meet this anxiety on the part of the farmers for the application of sewerage on a larger scale. I spare myself any comment on the dealing with the evidence on the subject and with myself,* which the omitted facts display. In themselves, and properly followed out, these same trial works would have been found to involve results decisive of the whole question of rendering the sewage available to agricultural production. Apart from these reported demands of the farmers, common and commonable lands and wastes within reach were examined at my instance and by the officer last named, were reported to be abundant for the purpose, and there can be no reasonable doubt that they are so. But those subsequently charged with the application of the sewage, refused to deal with the subject, declaring it to be beyond their powers, and in effect beyond their administrative capacities, though it was not beyond their capacities to subject the rate-payers of the metropolis to a charge of four millions for outfall works, for throwing the manure arising from two millions and a-half of population into the sea, an amount of money for which, I venture to declare, that every cesspool in the metropolis may be abolished, and a complete system of self-cleansing house drainage and sewerage effected, and outfalls provided for the constant delivery of the sewage, as at Rugby, in the several directions for productive and proved inoffensive application. Further discussion on these topics may be deferred until the appearance of the evidence under more recent inquiries.

I am, yours, &c.,
EDWIN CHADWICK.

ON LIQUID SEWAGE MANURE IN PARIS AND RUGBY.

Sir,—I cannot permit the statements which have been made as to the results of liquid sewage irrigation, near Rugby, to pass without comment. I have twice visited Mr. Walker's little estate, at Newbolds—on the 1st December, 1856, previous to the discussion on sewage manure, in which I took part on the 10th of that month, and a second time, on the 12th of March, 1857. On that occasion, I spent two days with the present tenant of half the estate, Mr. Berry Congreve, who has, from the beginning, managed it for Mr. Walker; and I occupied some time in questioning the bailiff of Mr. Campbell, who rents the other half. Rugby is easily accessible by railway, from any part of the kingdom. Mr. Congreve is most willing to afford every kind of information. I advise all those interested in the subject to go and see for themselves; but, for the benefit of those who cannot go, I give from my note-book the following facts, which are not exactly what might be expected, from Mr. Chadwick's statements before the Society of Arts. Rugby is situated on a hill; has been sewered and supplied with water—or rather not half supplied with water—under the plans of the Board of Health. Under these plans, the river, running through the Newbolds valley, intersecting a small property, then recently purchased by Mr. Walker (an attorney, from Bombay), would have been permanently polluted, and all the comfort of the house, overlooking the stream, destroyed in the same manner that, under Board of Health plans, the river at Hitchin has been polluted. To avoid this serious nuisance, Mr. Walker offered to take all the Rugby liquid sewage, in order to disinfect it, by using it on his land. He told me himself that he expected to get it for nothing, and that it was *worth nothing, per se*, but that another attorney having bid against him, he was obliged to give £50 a-year for it. Now, this sewage flows from the town, down-hill, into an open tank, built for its reception, close to an engine-house, and from thence is distributed, by cast-iron pipes underground, over two farms of about 500 acres,—one leased, at a high rate, in consequence of these sewage distribution arrangements, to Mr. Campbell, a Scotch gentleman of fortune, who amuses himself with an extensive dairy-farm at Rugby, and the other, leased to Mr. Berry Congreve, a grazier, since 1856, when Mr. Walker returned to his practice in Bombay.

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* At one of the meetings of the Society a representation was made that I had held forth to the farmers that sewage manure was of extraordinary value. Now, it is proper that my own words, as embodied in the minutes of information on the application of the refuse of towns to agricultural production, should be given. "In respect to the money value of town manures, where payment is made for their removal, (as in the majority of town districts) they cannot be properly said to have any money value whatsoever, their intrinsic value being counter-balanced by the labour and inconvenience of collection, removal, and application, and by the restriction, in consequence of the expense of removal, to a narrow field of application and a comparatively small market; but in proportion as the labour and consequent expense of collection and removal are reduced, and the conveniences and certainty of application of these manures are increased, as they will be by systematised works which may be substituted under the Public Health Act, their money value will be increased as compared with other manures, which are at present more convenient for use. Even the instances, far more numerous than herein cited, afford no definite tests of the probable value of the town manures, if only a proper system of collection, removal, and distribution be followed. The results stated in this report of increased crops from liquified manures, were frequently obtained on very ill-drained and ill-dressed lands. There can, therefore, be no doubt that if the land had, in all cases, been properly drained and had had good herbage, the yield and, still more, its value would have been greatly augmented."—Minutes of information on the application of sewerage to agricultural production, published by the General Board of Health, p. 61.

Mr. Campbell's bailiff told me that the sewage of Rugby was too weak, except in very dry weather, to be of any value; that they were very much disappointed in its strength, and that he had come to the conclusion that it was only worth while to use sewage at all when it could be obtained by gravitation without the expense of pumping, and that the water meadow system was much more effective for grass crops than pipe and hose, as well as less costly in labour. Mr. Campbell grows Italian rye-grass; he grows the first crop with solid dung; he then cuts four or five crops after dressing with liquid manure from his cowhouse, strengthened with gas liquor. "The sewage liquid manure is so weak, they only use it to wash in guano or soot." They "tried it with roots the first year, and made *a complete failure*." "They never dreamed of applying it to wheat—knew better."

I next turned and made my second visit to Mr. Berry Congreve's land. There *the sewage is applied only to grass*, and the results are very satisfactory, although "they would be more so if the stuff were stronger." The sanitary demand for water is opposed to the agricultural demand for manure; but this case is peculiar, and quite exceptional. The soil at Newbold's is a sort of comminuted rock, in fact, a natural filter bed, as porous as the filter-beds of any water-works. The consequence is, that the liquid sewage runs through as fast as it is applied, probably an acre would take all the liquid of Rugby. With such soil, a very rare kind of soil, the nuisance of liquid sewage will be reduced to a minimum, and the increase of grass is estimated by Mr. Congreve at from fifteen to twenty per cent., beside leaving all the solid farm manure for use on the arable land. This evidence is in exact agreement with the opinions expressed in the various discussions at the Society of Arts on liquid manure by Mr. J. B. Lawes and Mr. J. C. Morton, and by myself. [*See discussion on Mr. Mechi's Paper on British Agriculture*, p. 54; *Letters from S. Sidney*, pp. 95, 309, 498; *Mr. Lawes on the Sewage of London*, pp. 263, 278, 311; *and Correspondence* p. 309; *also, Mr. Cook's Paper, read March 10th*, 1857.] It has never been disputed that liquid manure would grow large crops of grass and Italian rye-grass, but the difficulty foreseen has been *in the cost of pumping from valleys*, and in the nuisance inevitably created wherever the soil has been not porous, as at Rugby, but retentive clay as round London. At Edinburgh the nuisance is so frightful that no attempt has been made for some years to extend the water meadows.

As regards the application of liquid sewage to cereals, I certainly understood Mr. Walker, when I visited him, in December, that in the only 10 acres of corn crops to which, out of nearly 500 acres, pipes for liquid sewage were applied, the results had not been successful. On my second visit in March, in the absence of Mr. Walker, I put the question to his late manager and present tenant, Mr. Berry Congreve, a most respectable, intelligent, and experienced agriculturist, who has throughout entirely managed the Newbold's farm, and he distinctly informed me "that as an experiment, wheat was grown on ten acres, (Newbold's being a grazing farm), with liquid sewage, and the result was an annual *diminution of crops*, which were throughout below average."

This result was to be expected by any one who knew that dry climates and dry seasons produce the greatest wheat crops.

Mr. Chadwick says, "at Mr. Mechi's and the new liquified manure farms, the yield of corn has been almost invariably one quarter heavier than the highest obtained by the ordinary culture." Now, in reply to this, I beg to say that Mr. Mechi's last and greatest crop was not superior to those of his neighbours cultivating soil of the same and inferior quality in the same climate; it was not equal, for an average of three or five years, to the produce of Mr. Fisher Hobbes, or Mr. Hutley, in Essex, or Mr. Hudson of Castle Acre, on the poor land of Norfolk. And this can easily be tested, as two at least of these gentlemen keep exact accounts.

But if Mr. Mechi's crop was equal to his neighbour's it was not grown with weak sewage liquid, or even with the pungent contents of his own liquid manure tubes, but, according to his own statement, with the addition of liberal applications of guano and salt, after the example set him, as to wheat, by Mr. Fisher Hobbes, and as to roots by Mr. Hutley, who in Mr. Nesbitt's, the agricultural chemist's words, when addressing the Central Farmers Club in the presence of Mr. Mechi, "without science beat Mr. Mechi with science." Since Mr. Nesbitt's speech, one of my friends, on digging up with his umbrella a specimen of Mr. Mechi's improved mangold-wurtzel crops, found a good dose of Lawe's solid superphosphate sticking to the roots. Mr. Mechi grew very bad crops while he adopted the liquid plan, but having since imitated the best farmers in Bedfordshire, Norfolk, and Essex, now grows very fair crops.

As to the reports of the Paris Commission they only prove what everyone who has paid any attention to liquid manure knows perfectly well, and freely acknowledges, viz., that an unlimited application of liquid sewage will produce a great deal of grass or other green vegetation. But as they say nothing about the cost, they do not prove that it would not have been cheaper to have used a cart-load of guano well mixed with water. The question of the use of sewage manure is a question of locality and soil, in fact, a question of cost, and the Parisian experiments only remind one of a mustard and cress grown on flannel as an example of market gardening.

Whatever is sound in the application of liquid manure to grass by pipe and hose is due to Smith, of Deanston, and not a single step in advance has been made since his time. It has been insinuated that farmers stupidly neglect agricultural theories, just as it is said they neglect farm-yard manure and deep drainage. The charge is unjust. The theory of deep drainage was brought before the public in 1844, and since 1846 farmers have paid, or paid interest on, twelve millions sterling for drainage works, and as much for new foreign manures. There is not a new homestead erected in which manure is not well saved, but farmers, like eminent chemists, like eminent engineers, put no faith in Mr. Chadwick's liquid manure theories, which all real experience invariably contradicts. I am, &c.,

Central Farmers' Club, Blackfriars. S. SIDNEY.

MECHANICS' INSTITUTES.

Sir,—Although in most Mechanics' Institutes which have evening classes the great majority are devoted to elementary instruction, it should never be left out of view that these do not constitute the main object of such Institutes, but are rather incidental to them. They are indeed the necessity arising out of the defects of early instruction, and therefore, while it is of great importance that so long as a demand for them exists, that demand should be gratified as far as possible, it is of primary consequence that the classes for more advanced studies should be encouraged to the fullest extent. Nor will there be found any want of the desire for such instruction if the resources of the Institute be but judiciously organized. At the London Mechanics' Institute the chemical class, conducted on the principal of mutual instruction, with Henry's Chemistry for a text-book, turned out many really good chemists, who have since attained a respectable position in the profession thus cheaply acquired. At the Rotherham Mechanics' Institute, a class has been established for the study of Political Economy. One of the members purchased Mill's work on the subject, at the cost of £1 16s., to be repaid by the others at the rate of 2d. a week from each. The chapters are read in turn by each member, and undergo discussion, so that they may be fully comprehended. There are many branches of useful knowledge that might be advantageously treated in the same way, and if such studies served no other purpose than to strengthen the mental faculties and occupy the leisure time of young men employed during the business hours of the day, they would prove highly beneficial.

So long, however, as the managers of Mechanics' Institutes devote their attention almost exclusively to a library, reading-room, and lectures they leave undone the most important part of their duties. None of these departments are without their value, but they are not of themselves sufficient to supply the want which is felt, and the mental energies of our young men, without that directing guide to beneficial results which such Institutes might so well supply, are too often expended in the demoralising dissipation for which the metropolis furnishes such abundant opportunities.

The great complaint, and one which appears to tell with most effect against the successful operations of Mechanics' Institutes is the want of pecuniary means, and the alleged apathy of those for whose benefit they are intended. Such a feeling is rather a proof of their necessity, and the desire must be created by that judicious blending of amusement with instruction which has rendered many periodical publications so popular.

Let us first, however, take into consideration the complaint of want of pecuniary resources. Many Institutes are attempted to be carried on upon rates of subscription so ridiculously low that under no circumstances can they be carried on without large gratuitous aid, which tinges them with the idea, at all times repulsive, of their being charitable Institutes. This has arisen from the fatally mistaken notion that cheapness is any recommendation. At the poorest night school in the country the charge is 3d. each for attendance, and yet many Institutes, professing to give class instruction, with the use of a library, reading-room, and occasional lectures, charge only 1d. a week, and rely for support upon the occasional guineas of wealthy and benevolent neighbours. What is worth having is worth paying for, and is not the less esteemed for the sacrifice which is made to obtain it. At Huddersfield Mechanics' Institute the charge is 3½d. a-week for little more than class instruction, and yet the lads who earn but a few shillings a-week are found to be the best-paying members. In a population of about 16,000, the Institute has more than 1,000 members, and the difficulty is rather to find room than to find students. At Sheffield there are three Institutes, the charge for classes being 3d. and 3½d. a-week, and the same difficulty exists in finding room rather than anxious learners. In many Institutes the Committees have been deterred from raising the rates of subscription through fear of losing members, but I believe such fear to be groundless, as I have known many instances in which it has been tried, and in each case it was attended with an increase of members instead of a decrease.

It should be borne in mind, however, that such a charge should be, as far as possible, accompanied with some additional advantages easily comprehended. The elementary classes should be placed under the management of competent teachers, who should be paid for their services according to the amount of school-fees. This would help to ensure regularity and punctuality of attendance, which are indispensable to success, and also give the teacher a positive interest in the number of pupils, while his exertions might receive such gratuitous assistance as the Institute could supply. Accommodation should also be afforded for mutual improvement classes, and with some additions to the Reading-room and Library the advance of subscription would be, in a great measure, justified. I have, however, reached my limits, but will continue the subject in my next.

EPHRA.

Proceedings of Institutions.

Northowram.—The general half-yearly meeting of the Mechanics' Institution was held on Monday evening, July 6th. Tea was provided, and at 8 o'clock W. Moore, Esq., the President, took the chair, and commenced the proceedings by calling upon the Secretary (Mr. J. W. Wood) to read the report, from which it appeared that the Institution was in a flourishing condition, both as regards the means at its disposal and the use that is made of them. The number of members at present is 114, showing an increase of 36 over the corresponding period of last year. Of these, 53 belong to the male classes, and 22 to the female classes. The latter are under the superintendence of several ladies of the neighbourhood, who kindly give their services for the benefit of the young females of the locality. These classes meet every Tuesday and Thursday for instruction in reading writing, dictation, composition, arithmetic, and needlework. The male classes are conducted by a paid teacher, in conjunction with voluntary teachers, and are very successful. The subjects taught are reading, writing, dictation, English grammar, geography, arithmetic, and mensuration. The average attendance during the half-year has been 27. The drawing class numbers 12 students, and meets every Thursday evening, under the superintendence of a special teacher. It was announced at the commencement of the year that prizes would be given at Midsummer; accordingly, an examination has been held, and the prizes would be distributed that evening to the successful candidates. For these prizes the Institution was indebted to Mr. Moore, and other gentlemen in the neighbourhood. The report stated that it was intended to hold an examination every half-year. Three lectures had been delivered during the season:—I. "On Common Things—Water:" by Mr. Washington, of Coley. II. "On Electro-Magnetism:" by Dr. Paley, of Halifax. III. "On Industry and Independence;" by Mr. Barnett Blake, of the Yorkshire Union of Institutes. The library had been added to during the year, and the number of books taken out had been ,050, against 383 for the year previous. The financial condition of the Institute was very good. The receipts for the half-year had been £21 14s. 4½d., and the expenditure £16 11s. 3d., leaving a balance in the hands of the treasurer amounting to £5 3s. 1½d. The next business of the meeting was the election of officers for the ensuing year. Mr. Washington then read the examiners' report, which spoke favourably of the manner in which the pupils had answered the questions, written and oral, which had been submitted to them, and the visible improvement made since he (Mr. Washington) had last tested them. The President next presented the prizes to the following successful candidates, and made suitable remarks to each of them. The prizes were handsome books, selected with special reference to the attainments and vocation of each of the recipients. First class:—Thos. D. Glendenning, reading and dictation; Ephraim Lee, mensuration and arithmetic; George Hanson, arithmetic and writing; Samson Pinder, diligence and improvement. Second Class:—Henry Smith (1st prize), reading and writing; William Brierley (2nd prize), reading and attendance; Thomas Jagger (1st prize), arithmetic; John Rushton (extra ditto), diligence and attendance. Third class:—Jesse Gelder (1st prize), reading and spelling; Abel Lee (1st prize), arithmetic; James Fawcett (second prize), writing and arithmetic; Edwin Stephenson, diligence and attendance. Female class:—Betty Naylor (1st prize), reading, composition, and writing; Maria Robinson (2nd prize), writing and arithmetic; Sarah Ann Fawthorp (1st prize), arithmetic; E. Jagger (extra ditto), diligence and attendance. The President remarked that he hoped that those who had been successful on this occasion would still persevere in their endeavours, and he encouraged the unsuccesful ones to look forward to a better result at some future time, reminding each of them that they gained a greater advantage to themselves in the knowledge they acquired, than in the value of the prize obtained. He urged upon those present who had not yet joined the Institution, at once to do so. He promised his continued support to the cause, as he was perfectly satisfied that it was answering the purpose for which it was designed. Mr. Stocks, in the course of an instructive and interesting address, urged upon all present the desirability of their devoting a portion of their time to their own mental and moral improvement, giving instances of persons who had risen to eminence in the world from even a lower position than that of any present, and pointed out the superior advantages now enjoyed by the rising generation from those available a few years ago. As an instance of this he need only point to their own Institution, where a really sound education might be otained for the small sum of 2d. per week, and so long as that was the case, he said no one ought to be ignorant of the elements of education. He congratulated the members on their present position, and felt assured that under its present judicious management the Institution would continue to flourish, and for his own part he would promise that it should not fail for want of funds. Resolutions, conveying the thanks of the meeting to the patrons and annual subscribers, the voluntary teachers, male and female, to the secretary, and to the chairman, were passed. Mr. Dawson contributed to the interest of the evening by giving at intervals well-selected readings from various authors.

Toronto (Upper Canada).—The Annual Meeting of Members was held on Monday evening, the 4th May last, in the Society's Hall, the President, E. F. Whittemore, Esq., in the chair. The Committee submitted the report of their proceedings during the past year, in which the they took occasion to point out that, amongst the numerous modern agencies calculated to direct and develop the moral and intellectual energies of the industrial classes of society, Mechanics' Institutes held a proud and prominent position. Indeed, it was difficult to form a proper estimate of their genial influences, and it was perhaps the misfortune of these useful Institutions that their beneficial results were not placed more prominently before the public eye. Individuals must be improved by their connection with these Institutions, for no one could read such books as their libraries contained, or listen to the public lectures, or peruse the choice periodical works of the day, or avail themselves of the many advantages they offered, without increasing their store of knowledge. As the cause of education advanced and gained new friends every day, it was impossible that such Institutions would not make progress with it. While the city of Toronto was rapidly increasing in population and material prosperity, and new societies of an educational, literary, and scientific character were springing into existence, it was most gratifying to the Committee to be able to report that the past year had been one of unprecedented success to the Institute. As respected the growth of the Institute, a most favourable result was shown, by comparing the year 1846—the year after the building now occupied was erected—with the present year, a period of eleven years.

	Population.	No. of Members.	Books in Library.
1846	20,600	120	800
1857	50,000	755	3,650

While the population of the city had more than doubled, the number of members in the Institute had increased more than six times, and the books in the library over four times. It appeared that the members consisted of—honorary members, 22; life members, 93; ordinary members, 499; junior members, 137; total, 751; with an actual increase during the year of 103. During the past year, 541 volumes, many of them valuable standard works, had been added to the library, which now contains 3,650 volumes. The number of members who availed themselves of this department was 625, being an increase of 125 during the year,—and the number of volumes issued amounted to 13,736, being 4,450 more than were issued during the previous year. In the reading room department, the committee announced a largely increased patronage. The number of members who availed themselves of its advantages increased to such an extent, that inconvenience sometimes arose from the crowded state of the room. To remedy this as much as the contracted building occupied would admit, the room had been enlarged, and the hours during which members could have access to it had been extended. The room was now open daily from 10 a.m. to 10 p.m., and was supplied with about sixty periodicals and newspapers, including the standard British Reviews, the principal Scientific, Commercial, and other Magazines and Journals; some of the leading newspapers of Great Britain and the United States; and a fair selection from the newspaper literature of Canada. In pursuance of the opinion recorded in the last report, and adopted by the members at the annual meeting, viz.: that the time had arrived when a change in the system of giving isolated lectures was desirable,—the serious attention of the committee was early directed to this subject, with a view to the organization of connected courses of lectures on subjects of interest and practical importance. The committee state, that the inauguration of the new system had been attended with complete success. Being favoured as the seat of several great educational establishments, Toronto was fortunate in possessing within itself men whose lives had been devoted to philosophical studies and scientific research; and among these the committee were able to secure the services of four gentlemen of acknowledged eloquence, learning, and ability, to deliver the lectures of the past season, which were as follows:—Four lectures on "The Primitive Sources of Historical Truth," by Dr. Daniel Wilson, University College. Four on "Chemistry," by Professor Croft, University College. Two on "Chemistry," and two on "The Mineral Wealth of Canada," by Professor Hind, Trinity College: and four on "Natural Philosophy," by the Rev. William Ormiston, Provincial Normal School. Confident that such a course would attract larger numbers than their present building could accommodate, the St. Lawrence Hall—the most spacious room in the city at present—was engaged for the lectures, and was generally well filled with attentive audiences. Notwithstanding the doubts entertained by many sincere friends of the Institute, the lectures in a financial point of view, might be considered satisfactory. In past years the printing, lighting, heating and other expenses, formed a considerable item in the expenditure; and in view of the increased outlay attending their delivery in the St. Lawrence Hall, and the remuneration to the lecturers, the committee appropriated the sum of forty pounds, from the general funds, to aid in carrying out the new arrangement. The lectures were in every respect self-sustaining, and instead of the appropriation being required, a small balance remained in favour of the Institute, after payment of all expenses. With the experience thus acquired, the committee had no doubt that in future greater advantages in this respect might be anticipated. Being without the requisite accommodation in the present building for the efficient organization of classes, the attention of the committee in this department was confined to the adoption of an arrangement with Mr. E. Nugent, by which members of the Institute were admitted to his classes in mechanical drawing, practical mathematics, &c., at half his usual charge. The committee had been informed that the progress of the pupils under Mr. Nugent's superintendence had been marked and satisfactory. The report was accompanied with a statement of the receipts and expenditure of the Institute for the past year, from which it appeared that the receipts from all sources amounted to £843 15s. 2d., and the expenditure to £814 18s. 4½d., the balance in the hands of the treasurer being £28 16s. 9½d. That the prosperity which had marked the progress of the Institute during the past few years, would be sustained and accelerated, the committee had every reason to hope and believe. Taking into account the comparatively small proportion which the number of members bears to those of the population who might beneficially avail themselves of the advantages the Institute supplies, it was evident there was still great room for further advancement; and the committee fondly indulged the expectation that when the time arrived that the members should be called to occupy their commodious new hall, the increased advantages and facilities, added to the greatly extended membership, would mark a new era in the history of this Institution, alike creditable to the Institute and the city. The election of officers then took place, and the thanks of the meeting were unanimously voted to those of the previous year, for their able services in conducting the Institution.

MEETINGS FOR THE ENSUING WEEK.

SAT. Royal Botanic, 3¾.

PARLIAMENTARY REPORTS.

◆

SESSIONAL PRINTED PAPERS.

PAR. No.

Delivered on July 2nd.

131. National Collections (Scotland)—Return.
98. Bill—Illicit Distillation (Ireland).

Delivered on July 3rd.

5. Pilotage—Return.
143. Hops, &c.—Return.
99. Bills—Superannuation Act Amendment.
100. Bills—Conveyance of Mails by Railways.

Delivered on July 4th and 6th.

130. Metropolitan Improvements—Copy of Report.
122. Sessions, &c. (Ireland)—Abstract of Return.
124 Queen's Colleges (Ireland)—Return.
127. Foreign Corps—Return.
144. Civil List Pensions—List.
154. Survey of Great Britain—Copy of Correspondence.

Delivered on July 7th.

40. Civil Contingencies—Account and Estimate.
109. Grand Jury Presentments (Ireland)—Abstract of Accounts.
119. Common Lodging Houses—Reports.
134. Hops, &c.—Return.
135. Printed Papers—Return.
79. Bills—Cruelty to Animals Act Amendment.
103. Bills—Land Tax Commissioners names.
102. Bills—Public Health Aldershot.
104. Bills—Boundaries of Land (Ireland).
101. Bills—Caledenian and Crinan Canals.

Delivered on July 8th.

117. East India (Torture)—Return.

Delivered on July 9th.

129. Sheep, &c., Contagious Diseases Prevention Bill—Report from the Committee.
105. Bills—Militia Ballots Suspension.
106. Bills—Metropolitan Police Stations, &c.
107. Bills—Insurance Companies.
108. Bills—Mutual Companies.

Delivered on July 10th.

132. Poor-law Union Schools—Return.
153. Expiring Laws—Report from Committee.
Trade of Various Countries and Places—Abstract of Reports.

Delivered on July 11th and 13th.

158. Foreign Legions—Return.
167. Persian Expedition—Estimate.
168. China (Military Operations)—Estimate.
133. Turnpike Trusts (Ireland)—Abstract of Statements.
142. Fire Insurances—Account.
149. China Surveys—Return.
130. Metropolitan Improvements—Copy of Report (corrected pages).
88. Bills—Assessments (Scotland).
109. Bills—Reformatory Schools (as amended in Committee and on re-commitment).
110. Bills—Pimlico Improvements (as Amended by the Select Committee).
111. Bills—Public Offices Extension (as Amended by the Select Committee).
112. Bills—Fraudulent Trustees, &c., (as Amended in Committee and on re-commitment).
113. Bills—Industrial Schools (as Amended in Committee and on re-commitment).
115. Bills—Public Works (Ireland).
116. Bills—Edinburgh, Canongate, and Montrose Annuity Tax Abolition.

Delivered on July 14th.

162. Portpatrick and Donaghadee Harbours—Return.
114. Bill—Dulwich College.

Delivered on July 15th.

141. Caledonian Canal—52nd Report of the Commissioners.

PATENT LAW AMENDMENT ACT.

APPLICATIONS FOR PATENTS AND PROTECTION ALLOWED.

[*From Gazette, July* 10.]

Dated 5th June, 1857.

1586. John Jordan, Liverpool—Improvements in the construction o iron ships or vessels.

Dated 11th June, 1857.

1636. George Farrell Remfry, Riches-court, Lime-street—An improved apparatus for supporting, protecting, and propelling the human body in water.

Dated 13th June, 1857.

1661. John King, Glasgow, N.B.—Improvements in the manufacture or production of collars, cuffs, and similar articles of ladies' dress.

Dated 16th June, 1857.

1684. John Fowler, junr., Cornhill, Robert Burton, Maberley-terrace, Ball's-pond road, and Thomas Clarke, St. James's-place, Hackney road—Improvements in the construction and arrangement of locomotive and other carriages, to facilitate their movement on common roads and other surfaces.
1686. Joseph Ellis, Brighton—Improvements in apparatus to be used for decanting wine and other liquids, and for drawing corks from bottles.
1688. Richard Goulding, 14, Bonner-road, Victoria-park—Improvements in the extraction of gold and silver and other metals,

Dated 17th June, 1857.

1690. John Smith, Oldham—Improvements in the manufacture of woven fabrics.
1691. William Hodgson and Henry Hodgson, Bradford—An improved lubricator or oiler by means of force pumps or valves.
1692. Salomon Sturm and Henry Emile Bour, Paris—Improvements in optical lenses, and in machines for manufacturing the same.
1696. Gustave Marqfoy, Bordeaux, France, Cours du Jardin Public, No. 110—Improvements in actuating railway signals.

1698. Frederick Ransome, Ipswich—Improvements in moulding plastic materials.

1700. Henry Hibbert, Salford, and Henry Richardson, Manchester—Improvements in finishing or polishing yarns or threads.

Dated 18th June, 1857.

1702. Thomas Lowell Ralph, and Thomas Lowell Ralph, jun.—An improvement or improvements in the manufacture of metallic tubes.

1704. Edward Sykes, and Matthew William Crawford, Glossop—Certain improvements in the construction and arrangement of the pans or vessels, and the furnaces and flues to be employed for the purposes of soap boiling, tallow melting, bone boiling drug boiling, and other similar offensive processes.

1708. Horace Hollister Day, New York, U.S.—Improvements in preparing and vulcanizing india rubber, gutta percha, or other analogous gums. (A communication.)

Dated 19th June, 1857.

1712. Simon Pincoffs, Manchester—Improvements in treating madder, munjeet, or any of their preparations.

1714. Joseph Hill, Mount-pleasant, Durham—Improvements in the permanent way of railways.

1716. Herman Jaeger, London Coffee-house, Ludgate-hill—Improvements in looms for weaving. (A communication.)

1718. John Dunnell Garrett, Saxmundham, Suffolk—An improved construction of horse-hoe.

1720. Robert Rennie, Netherwood, N.B.—Improvements in self-acting trap doors for mines.

Dated 20th June, 1857.

1724. Samuel Fox, Deepcar, Sheffield—Improvements in fly-presses.

1726. Samuel Fox, Deepcar, Sheffield—Improvements in the manufacture of umbrellas and parasols.

1730. Joseph White, Coventry—Improvements in escapements for chronometers and other timekeepers.

1732. William Rothwell Lomax, 5, Albion-villas, Albion-road, Hammersmith—Improvements in governors and pressure guages

1736. James Gascoigne Lynde, Great Queen-street Improved means for detecting and preventing the waste of water in cisterns.

1738. George W. La Baw, Jersey, U.S.—Operating the sails of vessels from the deck by means of vertical shafts.

Dated 22nd June, 1857.

1739. Peter Armand le Comte de Fontainemoreau, London, Paris, and Brussels—An improved propeller (A communication)

1740. William Edward Newton, 66 Chancery-lane—Improved machinery for cutting files. (A communication.)

1742. Sir Francis Charles Knowles, Bart, Lovell-hill, Berkshire—The manufacture of aluminium and of certain reagents to be used therein.

1746. William Knapton, Albion Foundry, Monk-bar, York—An improved machine for drilling holes in metal and other substances.

Dated 23rd June, 1857.

1747. Thomas Cooper Bridgman, Bury St. Edmunds—Improvements in the construction of screens, riddles, or sieves.

1749. Richard Shaw, Holme-lodge, and John Robinson, Lower-house, near Burnley, Lancashire—Certain improvements in machinery for preparing cotton and other fibrous materials.

1750. Duncan Proudfoot, Glasgow, N.B.—Improvements in drying and preparing garancine.

1751. James Hinks, Birmingham, and James Syson Nibbs, Handsworth—Improvements in securing and liberating the corks or stoppers of bottles, and in the construction of the necks of bottles, for facilitating the securing and liberating of corks and stoppers.

1752. Daniel Evans, 15, Railway-terrace, New-town, Stratford—Improvements in locomotive and other furnaces, and in heating water to be supplied to steam boilers.

1753. Richard Archibald Brooman, 166, Fleet-street—Improvements in breech loading fire-arms. (A communication.)

1754. Joseph Scipion Rousselot, Paris—An improved method of obtaining motive power, and engine for applying the same.

1755. Richard Archibald Brooman, 166, Fleet-street—An improved method of engraving and of copying figures, patterns, and other devices. (A communication.)

1756. William Edward Newton, 66, Chancery-lane—Improvements in generating or obtaining motive power. (A communication.)

1757. Edward Woolley, High-street, Marylebone—An indicator for registering the names of persons occupying chambers and other apartments or offices, and for signifying whether such persons are in or out, and at what time they will return.

Dated 24th June, 1857.

1760. Charles Herault, Paris—Improvements in apparatus for producing aerated waters. (A communication.)

1762. Charles Frederic Vasserot, 45, Essex-street, Strand—Improvements in the permanent way of railways. (A communication)

1766. Alexander Parkes, Birmingham—Improvements in coating metals with other metals.

1768. Charles Sanderson, Sheffield—Improvements in the manufacture of railway bars, girders, and other articles requiring great strength and stiffness to resist pressure, concussion, or strain

1770. Joseph Exley and John Ogden, Leeds—Improvements in furnaces or fireplaces for the prevention of smoke

1772. John Henry Johnson, 47, Lincoln's-inn-fields—Improvements in apparatus for testing the strength of materials. (A communication.)

1774. Richard Archibald Brooman, 166, Fleet-street—An improved composition or polish for maintaining the brilliancy of varnished or patent leather. (A communication.)

Dated 25th June, 1857.

1777. John Talbot Pitman, 67, Gracechurch-street—Improvements in machinery for making wood screws. (A communication.)

1779. William Green, 1, Ebury-street, Pimlico—The letter announcer.

1781. Josiah Wright, 8, Ernest-street, Alfred Wright, 1A, Bayham place, and Francis Roberts, 80, Bayham street, St Pancras—Treating the rhubarb plant, to render its fibres applicable to the manufacture of paper, and the juice thereof to the manufacture of wine and spirits.

1783. John Ingham and Edward Ingham, Bradford, and Benjamin Ingham, Halifax—Improvements in preparing worsted yarns for dyeing

1785. Antonio Pelez, 19, Southampton-buildings—A new composition for the manufacture of imitative stones. (A communication.)

1787. William Palmer, 156, Western-road, Brighton—Improvements in watering pots, garden engines, and other apparatus for watering surfaces.

1789. William Price Struvé, Swansea—Improvements in miners' safety lamps.

Dated 26th June, 1857.

1793. John Lloyd, M.D., Langefui, Anglesea—Improvements in utilizing and deodorizing sewage matters of dwelling-houses and other places, and in apparatus to be used in connection with the same.

1797. Benjamin Nicholls and Samuel Ledward, Manchester—Improvements in mules for spinning.

1799. Francis Watkins, Victoria Works, Smethwick, near Birmingham Improvements in the manufacture of screw nuts. (A communication)

1801. Bennett Johns Heywood, Leicester-square—Improvements in the manufacture of india rubber goods.

Dated 27th June, 1857.

1803. Jonathan Preston, Pendleton, Lancashire—Improvements in apparatus for regulating the pressure of steam and other fluids.

1805. Charles Thurber, Worcester, U S. An improved kaligraph or writing machine, for writing and similar purposes.

1807. Richard Howland, London—Improvements in the construction of mangles.

1809. Arsène Auguste Olivier, Paris—Improvements in treating or preparing and winding silk from the cocoon, and in apparatus for the same.

1811. John Carter and Brook Hodgson, Halifax—Improvements in weaving carpets and other fabrics.

1813. James Biggs, 472, New Oxford street—A portable folding perambulator, which is so constructed as to occupy less space than any that has hitherto been invented.

Dated 29th June, 1857.

1815. Samuel Nye, 79, Wardour street—Improvements in mills for grinding coffee, pepper, spices, and other substances.

1817. Juan Pattison, Moorgate street—An improved rotatory pump.

1819. John Forster Meakin, 84, Baker-street, Portman-square—Improvements in carriages for children, commonly called perambulators, and applicable to carriages for invalids.

1821. John Lyon Field, Lambeth, and Charles Humfrey, junr., Camberwell—Improvements in the manufacture of candles.

1823. William Maltby, Grove-hill, Camberwell—Improvements in the mode of extracting ammonia and other compounds from gas, gas liquor, sewerage, and other substances.

Dated 30th June 1857

1825. Thomas Hardcastle, Bradshaw, near Bolton-le-Moors—A machine for doubling, winding, plaiting, and measuring cotton and other fabrics.

1827. William Parsons, 25, Clifton-street, Brighton—Improvements in fastenings for windows and casements, and for other similar purposes.

1829. Andrew Spottiswoode, 12, James-street, Buckingham gate—Improvements in machinery for compressing artificial fuel and other substances.

WEEKLY LIST OF PATENTS SEALED.

July 10th.

104. Alfred Bower.
106. Walter Thurtell.
107. William Gossage.
109. Michael Potter.
116. John Coope Haddan.
121. David Hamilton Fowler.
129. George Bedson
243. John Elce and John Hewitt.
285. John Allin Williams.
313. James Taylor.
757. John Millar.
1119. Amory Fairbanks Sherman.
1251. Agostino Gatti.

July 14th.

128. Julius Homan.
135. Henry Henson Henson.
182. Samuel Neville.
224. John Fortescue.
228. Rd. Archibald Brooman.
230. William Henry Brown.
826. Charles François Leopold Oudry.
1244. Benjamin Chew Tilghman.
1282. George Tomlinson Bousfield.

PATENTS ON WHICH THE STAMP DUTY OF £50 HAS BEEN PAID.

July 9th.

1512. George Arthur Biddell.
1513. Paul François Aerts.

July 10th.

1543. John Baptist Chauvet.
1562. George Wade Kelsey.

July 11th.

1524. Oliver Maggs.
526. John Knowelden.
1531. William Armand Gilbee.
1546. William Bishop.

Journal of the Society of Arts.

FRIDAY, JULY 24, 1857.

ART TREASURES EXHIBITION.

The period fixed for the Society's visit to the Art Treasures Exhibition at Manchester, is the week commencing Monday, the 3rd of August.

Arrangements have been made with the Great Northern Railway to take the members and their friends from London to Manchester and back, by any trains, *express* or otherwise, on and after the 1st of August, at a fare and a-half the double journey, viz., £2 12s. 6d., 1st class; £1 17s. 6d., 2nd class. The tickets to be available for seven days from the date of issue.

The Great Northern will also, if a sufficient number of members express their intention of going, run a special train on Monday, the 3rd of August, for their accommodation; but, to enable this to be done, the members should send in their names to the Secretary of the Society as early as possible.

The members are invited to a *Soirée* at the Royal Institution, Manchester, on Wednesday, the 5th of August. Ladies are invited.

Excursions will be arranged to visit some of the distant mills and manufactories.

It is proposed that the members and their friends should dine together on one day during the visit.

As in the case of the visit to Paris, persons duly proposed for membership will, though not actually elected, be admitted to all the privileges of the Manchester visit.

The Local Committee at Manchester have made the following arrangements:—

The Literary and Philosophical Society of Manchester have placed their rooms (George-street) at the disposal of the Society of Arts, where a reception room will be provided for the members, and proper officers will be in attendance to give information, and where communications may be addressed on and after the 27th July.

Permission has been granted for the members to visit the following warehouses, works, &c., during the week of the visit on showing their cards of membership:—

Warehouses.—S. Fletcher, Son, and Co., Manchester; J. and N. Philips and Co., Manchester; John Pender and Co., Manchester; S. and J. Watts and Co., Manchester.

Iron Works, &c.—Edward T. Belhouse and Co., Manchester; Wm. Fairbairn and Sons, Manchester; P. Fairbairn and Co., Leeds; Joseph Lockett and Co., Strangeways Engraving Works, Manchester; Mather and Platt, Manchester; William Muir and Co., Britannia Works, Manchester; James Nasmyth and Co., Patricroft, Manchester; Parr, Curtis, and Co., Manchester; Peel, Williams, and Peel, Manchester; Platt (Brothers) and Co., Oldham; Sharp, Stewart, and Co., Manchester; Joseph Whitworth and Co., Manchester; Richmond and Chandler, Agricultural Implement Works, Manchester; James Walton and Co., Cardmakers, Denton.

Glass Works.—Percival Yates Vickers, Manchester; Webb and Ellis, Kirby-street, Manchester.

Mills and Manufactories.—Jas. Akroyd and Sons, (Worsteds, &c.), Halifax; Armitage and Ward, Manchester; Sir E. Armitage and Sons (Cotton), Manchester; Thomas Dickins and Co. (Spring Vale Dye Works), Middleton, near Manchester; Thomas Hoyle and Co., Mayfield Print Works, Manchester; Thomas Houldsworth and Co. (Cotton), Manchester; Kershaw, Leese, Sidebotham, and Co. (Cotton), India Mills, Manchester; Marshall and Co. (Flax), Leeds; Oxford-road Twist Company (Cotton), Manchester; Samuel Radcliffe and Sons (Cotton), Rochdale; Titus Salt and Co. (Worsteds, &c.), Saltaire, Bradford; Seedley Printing Company, Manchester; Richard Sykes, Bleach Works, Stockport.

Permission has also been received to visit the following Institutions:—

Royal Exchange (Reading Room). Royal Infirmary. Ragged Industrial Reformatory Schools. Athenæum (Reading Room). Mechanics' Institution. Chetham's Library. Free Library. Peel-park Museum and Library. Manchester Corporation Water Works.

It is to be distinctly understood that the members have *not* permission to visit works where a manufacture is carried on of similar character to any in which they may be engaged or may be personally interested.

Members desiring any information respecting accommodation at hotels or lodgings, should apply to Mr. Haden, at the Offices of the Art Treasures Exhibition Committee, 100, Mosley-street, Manchester, with precise information as to the extent of accommodation, and the period for which it is required.

Members intending to join in this visit are requested to communicate AT ONCE with the Secretary, in order that the number going may be ascertained, and the Cards of Membership forwarded.

Members will have the privilege of introducing two friends, either ladies or gentlemen, to join the party, to whom cards will also be issued on the application of a member.

SOCIETY OF ARTS DISTRIBUTION OF PRIZES AND CERTIFICATES AT HUDDERSFIELD.

The annual meeting of the Yorkshire Union will take place in Huddersfield, on Wednesday next, the 29th instant. In the forenoon there will be a Conference of Delegates from the several Mechanics' Institutes in Union, held in the Gymnasium-hall, Edward Baines, Esq., President of the Union, in the chair. The members will dine together in the afternoon, at the Queen Hotel, and in the evening there will be a soirée in the Riding school, at which the Right Hon. Earl Granville, K.G., will preside, and distribute the prizes and certificates awarded at the recent examinations of the Society of Arts at Huddersfield. Amongst the noblemen and gentlemen who have promised to be present on the occasion, and take part in the proceedings, are Viscount Goderich, M.P., the Hon. and Very Rev. the Dean of Ripon, Col. Sykes, M.P., Edward Akroyd, Esq., M.P., R. Monckton John Milnes, Esq., M.P., H. W. Wickham, Esq., M.P., Sir Richardson, the Rev. Dr. Booth, F.R.S., Chairman of the Council of the Society of Arts, Hen. Pease, Esq., M.P., J. P. B. Westhead, Esq., M.P., M. D. Hill, Esq., Q.C., Recorder of Birmingham, W. E. Foster, Esq., James Glaisher, Esq., E.R.S., John W. Childers, Esq., J.P., &c. On the following day, the visitors are invited to inspect the celebrated Low Moor Iron Works, and afterwards to proceed to Meltham, where there are manufactories of woollen and silk fabrics, and cotton-thread, all of which will be open to their inspection.

EXTRA-ORDINARY MEETING.

Wednesday, July 22, 1857.

An Extra-ordinary Meeting of the Society for discussing the Decimal question, was held on

Wednesday evening, the 22nd instant, Thomas Matthias Weguelin, Esq., M.P., in the chair

The Chairman said the present meeting had been convened for the purpose of discussing the decimal question, and the Council of the Society of Arts, in order to ensure a full discussion without running into matters not exactly relevant, had thought it advisable to confine the speakers to the three following points:—

1st. Whether the use of decimal notation should be extended.

2nd. Whether it should include monies, and if so what should be the unit.

3rd. Whether it should be extended so as to embrace weights and measures, and if so what should be the respective units.

It was, in the first instance, thought that it would be desirable to read the report of the Commissioners, but as that would take up too great a length of time, and as it was presumed that most gentlemen present were familiar with its contents, it was thought better not to occupy the time of the meeting by so doing. He thought that report contained a very succinct and clear history of what had been done in this country with regard to this question. He would suggest to the speakers in the first place to be as brief as possible in their remarks: and secondly, to remember that the three points more or less ran into each other. The first point was the abstract proposition, whether the use of decimal notation should be extended. Although it might be necessary to illustrate this by reference to the two other points, yet he thought it desirable to reserve those points for subsequent discussion.

DISCUSSION.

The Secretary read the following letters:—

Dr. Farr (of the General Register Office) says:—

"I regret that I have a previous engagement, and am hence unable to attend the discussion of the decimal question.

"It is a subject to which I have paid much attention, and it was discussed partially at our last Statistical Congress in Paris.

"I send you my replies to your questions.

"1. I think the decimal notation should ultimately be extended to all measures.

"2. I think it should extend to monies. The *primary unit* should be the sovereign or £1 sterling. This would be represented by a *gold coin.* A unit of this magnitude is required for statistical purposes, and for all the larger payments and large operations of commerce, and there is no other large unit (gold) in the field to compete with the British £1.

"The secondary *unit* would be the *florin*, of the value of the 10th part of the £1. It would be the unit of the silver coinage.

"The *tertiary unit* would be the cent or the 10th of the florin, but this is not indispensably necessary, as it may be conveniently expressed in mils.

"The *mil* would be the lowest unit, to be represented by a *copper coin*: 1000 mils would = £1; 100 = one florin; 10 = one cent. I write £1 17s. 6d. thus: £1 8fl. 75 cent., or, £1·875.

"For minute calculations more decimals are necessary. It is found in stating the value of annuities of £1, necessary to give more than three figures to the right of the decimal point.

"I have shown in my report, as one of the delegates of the Government at the Statistical Congress, that this system of coinage might easily be brought into harmony with the continental system by slight concession on *their side.*

"Then, the concession on our side should be made in reference to their weights and measures.

"The *French metre*, taking it altogether, has the best claim to adoption. Our yard cannot contend with it for a moment, and I am not aware that there is any other unit in the field. I, therefore, adopt the metrical system.

"The weights are connected almost indissolubly with the measures through the cube of water. I take willingly the kilogramme—which is nearly the 1000 part of our ton—as the unit of weight, or 1000 kilogrammes in the place of our ton.

"I have no doubt the discussion will do good. Our commercial accounts are, I think, in a barbarous state, and remind one of the French agricultural implements. While our agriculturalists are adopting the improvements which the progress of science places at their disposal, and have formed numerous societies to promote improvements, I see no corresponding movement on the part of the commercial classes. They cling to their old cumbrous systems of accounts and of arithmetic with as much pertinacity as our old generals clung to "brown bess."

"For the sake of our English trade and credit, I hope that some of our young commercial men and our enlightened merchants, such as Mr. Weguelin, will take up the decimal system in earnest, and carry it out into practice. It lies at the root of Commercial Reform. The goverment might order the public accounts to be kept on the decimal system at once. I trust that we shall hear no more of the penny unit, as that basis is too ridiculous to deserve serious consideration by such a distinguished body of men as the Society of Arts."

"P.S.—See a copy of my report on the "Statistical Congress, in the 16th Report of the Register-General."

Mr. Charles Atherton, (Chief Engineer, Woolwich Dockyard), says:—

"I beg to submit a few observations, merely to give my testimony as to what I find to be the requirements of every day's work in the line of engineering pursuits which I have occasion to follow.

"First of all, then, I beg to state that in my every day's work I cannot move without decimals. The *Journal of the Society of Arts* bears on the face of it that no scientific inquiry can be effectually prosecuted without the use of decimals, and whether Government take up the matter of establishing a general system of decimal notation or not, individual necessity is now gradually leading to that result, for every individual whose daily avocations involve the use of figures must, as times go, adopt the decimal system of calculation, or be left behind in his course, or remain ignorant on many points of inquiry that he would otherwise investigate. The duties of my position frequently require me to examine into the educational qualifications of youths, applicants for appointments in H.M. Service. I regret to find that decimal arithmetic is too much neglected in the majority of schools, and it is my opinion that one of the most important spheres of usefulness to which the Society of Arts can devote its labours and utilize its influence, will be to urge on its Associated Institutions, and on the public generally, the cultivation of decimals as an indispensable element of education. I would submit that decimals, instead of coming last in our school arithmetical text books, and being thus regarded as an accomplishment in which but comparatively few youths become proficient, should be regarded as one of the rudimentary elements of arithmetic, which every boy should learn. In fact, it should be engrafted on the numeration table, for numeration is not complete without it.

"As to whether a complete decimal system and a corresponding nomenclature should be at once extended to money, weights, and measures, and units of each be specifically determined, I imagine that theoretically the desirableness of such a consummation is unquestionable; but there is no royal road to perfection of any kind; the practical question is, How shall we begin?

"I say, let us begin by making every schoolboy familiar with decimal notation and numeration. Let the decimal system be thus instilled into the minds of youth as the proper method, of working figures. Every youth as he advances in life, will then apply the decimal notation to whatever units of measure may concern him in his daily avocations. Tables of equivalents expressing in decimals the subdivisions of our present units, would be learned by rote, and soon become familiar; and decimal instead of non-decimal language and ideas and habits of thought, would gradually prevail, and pave the way to a national system of decimal nomenclature, which would doubtless constitute a great improvement upon the merely arithmetical acquirements above referred to. I am of opinion that at the present moment the condition of popular education, by excluding the decimal notation and numeration from our rudimentary arithmetic, has not duly paved the way for the immediate introduction of the complete change now in contemplation. But I see no occasion for subverting our present scales of money, weights, and measures, by legislative enactment, for, decimal arithmetic being once popularised, would more and more work its own way, and forcibly conduce to the legalisation of an appropriate decimal nomenclature, expressive of the tenths, hundredths, and thousandths of the respective units of money, weights, and measures, and the facilities of calculation afforded by the new system would gradually cause the old system to be voluntarily neglected and die out, without any legislative superseding thereof.

"For example. With reference to the unit of £1 sterling, our present shillings, pence, halfpence, and farthings, might remain in circulation, but they would gradually vanish from the thoughts of the rising generation if the decimal subdivisions of the florin were legalised, and in fact, by the introduction of the tenth of a florin, all our present copper coinage of pence, halfpence, and farthings, would have distinctive values in the third place of decimals. A national decimal system of money, weights, measures of bulk, and lineal measures, being once introduced, would become speedily popular, the conveniences of the system would be felt, and probably the still further extension of the system, recognising *international* units, might gradually supersede the national units by the operation of the same process, and for the same reasons of public and individual convenience, as our present scale of shillings, pence, and farthings would be superseded by the decimal system of florins and its subdivisions as above referred to.

"I therefore beg to suggest that by first of all revising our educational system of arithmetic, and then adopting a decimal system of coins, weights, and measures, having for their respective units some coin, weight, and measure in present use, such as the £1 sterling, the 1lb., and the lineal foot, a gradual introduction of the decimal system would ensue, as the rail has superseded the road, without violence to the existing state of things in any way. I know of no instance in which the old roads have been ploughed up, or old ships burnt, by Act of Parliament in consequence of the introduction of the rail and steam. In like manner a national decimal system of money, weights, and measures may be introduced, without legislatively superseding the old."

The Chairman said, in opening the discussion upon the first point, he would merely remark that he believed the use of decimal notation in this country, as far as the public were concerned, was at present confined to the bullion office of the Bank of England and to the Custom-house. He believed those were the only two places where decimal notation had been introduced and brought into practice. He should be glad to be informed by any one present whether it had been introduced elsewhere.

Mr. Dawbarn said the Custom-house adopted decimal notation for the measurement of ships.

Mr. Miller (Bank of England) said—The Royal Commission appointed to determine "how far it may be practicable and advisable to introduce the principle of decimal division into the coinage of the United Kingdom," have made a preliminary report, in which, after a masterly resumé of all that has yet taken place on this subject, is found the following paragraph:—"A series of questions has been laid before us, prepared by one of our members, Lord Overstone, described by their author as being drawn up with a view of bringing under our distinct notice and examination some of the advantages of the present system of coinage, and some of the principal difficulties and objections which have been suggested with respect to the introduction of a system of decimal coinage." It has appeared to the Council of this Society to be desirable that the meeting should discuss the principal matters involved in these questions under three heads, as stated by the chairman, and that these questions should each be brought to an issue separately. He, therefore, proposed then to consider the first of these; whether the use of decimal notation should be extended? The decimal notation, upon which is based the science of arithmetic, extends over the whole earth. It has existed time out of mind. It appears in the very oldest record. It has sprung up spontaneously in nations widely remote, with natural barriers of ocean, or desert, or still more natural antipathies between them. In one nation it progresses from 1 to 10 to the right hand; in another to the left; but it is always the same decimal notation. There is no novelty in these considerations; they were entertained when men were accustomed to think as well as to talk. Lord Monteagle, in question 266, quotes a passage from Aristotle's problems, to the effect, "that it seems a law of nature that 10, 100, and 1000 should be adopted, otherwise it would be impossible to explain their universality, and this not only among civilised but amongst uncivilised nations." He (Mr. Miller) had not the least doubt that it was "a law of nature;" that it was the natural mode of the manifestation of the faculty of number, of which the ten fingers were the first instruments, and the ostensible cause of the limitation to ten; and that all other modes were abnormal and burdensome, and led to confusion. If the meeting refused to admit this doctrine, he knew well that the converse of it could not be maintained, and whether admitted or not, the decimal notation, with its superstructure of arithmetic, remained a fact, an existence, a necessity, which must be dealt with, which cannot be escaped from, and can no more be subverted than the Andes overturned, or gravitation suspended, or any other impossible thing be done. There is a sentence in Euripides, quoted by Epictetus, to the effect, that "He is the wise man who, with a good grace, accommodates himself to the things of necessity." In the progress of nature, that which cannot so accommodate itself, which cannot adapt itself to her constantly varying conditions passes away. This was a law imposed on all organisms. "Whom the gods doom to destruction, they first strike blind," and this truth England, above all nations of the earth, had been blessed with the light to see; and with the desire, and with the power to conform to it. To cast off all that was not congenial with her constantly renewing life, how much rottenness has she cast away in our time. West India slavery, she was told, was her right hand, but it was an offence, and she cut it off. Protection was the apple of her eye, but she plucked it out. They were not, in her view, according to nature. He (Mr. Miller) would not pursue this course of observation any further than to suggest whether this condition of irregular weights, measures, and money, might not be a rotten member of no small consequence—whether our compound arithmetic, which it necessitated, did not lead the minds of the generality of the English people away from the healthy practice of a natural and universal science, to embarrass them with a needless multitude of special contrivances, which obstructed the education and retarded the business of every-day life. And these were the chief grounds of his objection to the present weights, measures, and money, that they obstructed education, and retarded the business of every-day life. The greatest difficulty attending the education of the children of those who gain their living by labour, was not so much the question of what it was of the most importance that they should be taught, to fit them for good and useful citizens, or how to find teachers for them, but how to find the time to teach them; because, when they were most apt to learn, before the passions were awakened, and at the time that the intellect began to dawn, between the ages of ten and twelve their labour became of so much value to their parents that they could no longer be kept at school. It was just at that most valuable time, when they might acquire a thorough knowledge of arithmetic, practical geometry, and mensuration—of all learning the most useful to them, whether they became bricklayers, or masons, or carpenters, or blacksmiths, or coopers, or have to practice any other kind of handicraft—it was at that time that this burthen of irregular weights, measures, and money, was laid upon them for life. The time required to master that obstruction barred all further progress in their education, and they went on, all through life, bearing this useless but galling burden, without even that knowledge which would enable them to bear it with greater ease, though not, perhaps, with greater patience. He had heard it said by those whose chief business of life seemed to be to show, as Mr. Dickens says, "how not to do it," that the extension of the decimal system would be of great advantage to the opulent classes, but injurious to the poor. These obstructives, from a memorable instance downwards, had always had the poor in their mouths whenever any good work had to be wrought. That this was really the poor man's question as well as the rich man's he was sure, and one in which he was most deeply interested, but not in the way they would have them believe, and he, Mr. Miller, did not think that any one could be rightly considered as friendly to the education of the poor who was indifferent to this question. He would not enlarge upon this point, because he saw that Professor de Morgan was present, and before all other people, upon this subject that gentleman was entitled to claim the attention of the meeting. That these irregular quantities retarded the business of every-day life, he thought nobody present would be hardy enough to dispute. In almost all cases in the decimal system there was a saving of figures in the mere record of the quantities. It was an enormous saving of figures when the arithmetical rules were applied to those quantities. In merchants' packages the weights stopped at a pound; and except in the case of very heavy goods, they were recorded in cwts., qrs., and lbs. Now, 56 cwts. 1 qr. 16 lbs. required five figures to record them, while their equivalent in pounds require only four, 6,316 lbs., with this enormous advantage, that the pounds were always ready for any arithmetical operation, without the tedious conversion of cwts. and qrs. into lbs., or the qrs. and lbs. into decimals of the cwt. He (Mr. Miller) had once shewed the process in this room, of the calculation of duty and the tare of 3 butts of currants, as those calculations were made in the Custom House, and how they would be made were the decimal system extended. In the present mode, the calculation required 174 figures. As it would be done under a decimal system it would only require 21 figures. More than 8 times as many in the present, as under a decimal system. But, after all, the number of figures was of small consequence, and the comparative merits of the two systems judged by the number of figures could not be estimated. It was not so much the number of figures used, as the facility with which they were used, which constituted the excellence and superiority of the decimal over every other system of quantities. They had had, in the Bank of England, experience of the saving of time and labour in the change which had been effected in the troy-weight, which had been confirmed by the Act of 16 Vic. cap. 9. Yet Dr. Gray, with a perverseness for which it was difficult to account, made a statement in answer to question 435, in reference to this subject, which was altogether unjustifiable.

> 435. "I ask you whether, with respect to the facility of the operation and avoidance of the chances of errors, there is not a distinction in favour of the statement of pounds and working out pounds simply, over the statement and working out shillings, pence, and farthings, in all the more complicated systems of accounts?—There can be no doubt that there is a greater regularity in the mode of their addition, but I believe that the breaks are useful in diminishing the chances of error. I may observe, as an illustration of the question, that a great deal has been said about the introduction of the decimal system in weighing gold in both the Mint and the Bank of England; yet I am told by more than one officer in both those establishments that they prefer the old method to the new one, as being more easy and certain in the operation.
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> 436. "In page 22 of your pamphlet you refer to the head of the bullion department as an authority to show "that the change had not been attended by any reduction of labour, but on the contrary, by an increase; that the clerks were continually obliged to refer to the table showing the two systems, and that the new system was found so inconvenient that two of the largest bullion brokers refused to use it." Could you give the Commissioners the names of those bullion brokers?—I do not consider myself at liberty to mention their names without permission. But I give you the words exactly as Mr. Haggard used them to me in conversation. I asked whether he had any objection to my recording it, and he allowed me to do so; and I was told at the Mint exactly the same thing by two of the chief officers a few months ago. And I may further add, that since the new system has come into use at the Bank, they have found it necessary to publish "Decimal Tables as used at the Bank."

There were, he knew, several gentlemen in the room connected with bullion dealings, who would bear, if necessary, their testimony to the utter fallacy of this statement. He did not say that Mr. Haggard might not have said what was imputed to him, about the time of the inception of this new mode; but mere after-dinner gossip, uttered years ago, was not fit matter for evidence on so grave a subject now; especially when Dr. Gray might have assured himself of the facts with very little trouble. There was a vast amount of insignificant twaddle in the evidence, which fatigued and stupified the mind, and he wished that that was the worst he could say of it. Then again, there was a quotation from Vaughan, and another from Napoleon, which had an almost epigrammatic force, and was perfect so far as style went; it only wanted one thing to render it perfect, and that is what they both wanted—truth. Mr. Shaw and Dr. Gray spoke of the English systems, as a combination of the binary and the duodecimal systems. The English system was neither a binary nor a duodecimal system, nor any combination of such systems, nor was there any harmonious relation whatever existing between our weights, measures, and money. On the contrary, it was scarcely possible to imagine more utter confusion. The binary system was a system progressing by twos; 1 and 0 stand for two, 1 and 00 for 4, and so on. That was the binary system of Leibnitz. A duodecimal system would be a system that in like manner progressed by twelve, just as the decimal system progressed by tens. That was the meaning of the terms; but that was not what these gentlemen meant. They must mean, if they meant any thing, that our weights, measures, and money were constructed upon the numbers 2 and 12, and that they were, therefore, susceptible of binary and duodecimal division. Let us see. Take the avoirdupois weight. You cannot divide the ton by two, and come down to the hundred-weight, the quarter, the pound, the ounce, the dram, or the grain. You cannot divide the hundred-weight by 2, and come down to the pound, the ounce, the penny-weight, or the grain. In the pound, although you cannot reach the grain, you can only come down eight stages to the dram. He did not say that there were not some advantages in the 16 ounces to the pound; but he believed the advantages of a decimal division of the pound would far overbalance them. Again, you cannot divide a pound by 2, and come down to a shilling, a penny, or a farthing. You cannot divide a shilling by 2, and come down to a penny or a farthing. You cannot divide a pound by 12, and come down either to a shilling, a penny, or a farthing. You cannot divide a penny by 12. In what sense is it then that our system can possibly be called a binary and duodecimal system. He hoped they should hear no more of such nonsense. Then, again, of the decimal system as applied to money. It is predicated that there must be "an inferiority as regards fractional divisibility, as compared with a coinage founded on a combination of the binary with the duodecimal scale," meaning the present scale. Now, what was it that was divisible? Not the coins. They are not cut into pieces. It, therefore, must be their constituents, and the divisibility must ultimately be limited to the number of the smallest coins contained in the largest. Thus 960, the number of farthings in the pound, comprehended all its divisions, as, in a decimal scale, 1,000 would all its capabilities of division. Admitting the greater divisibility of the shilling, what was the value of it? Were the pound weight in question, he could understand that its greater divisibility would be an object of importance. A pound of butter, a half a pound of butter, a quarter of a pound of butter, were the same quantities, and always wanted, but the prices of butter were various. If a shilling were a constant price of a great many divisible commodities, or a pound were the same, or a penny the same, their divisibility would be a matter of consequence; but prices were anything, from a farthing to a pound, and the shilling was not only not a frequent price of divisible things, but was a rare price. A large number of things were made up to sell for a shilling as wholes. It was the price of admission to exhibitions, it was the price of thousands of common things, but not things sold by the pound or the yard. The pound under a decimal division might be supposed to have 1,000 parts, or gradations of price—under the present it had 960. How would these gradations of price admit of divisibility by the prime numbers?

Number of prices which may be divided by—	In the 1000 parts.	In the 960 parts.
2	500	480
3	333	320
4	250	240
5	200	192
6	166	160
7	142	137
8	125	120
9	111	106
10	100	96
	1927	1851

This put beyond all question the superiority of the decimal over the present scale, so far as the divisibility of the prices they afford. He hoped, therefore, that they would hear no more about the non-divisibility of the decimal scale. He believed that the extension of the decimal system would be of the greatest importance to this country. In this respect the most important of the nations of the earth besides were in advance of us, and we are at a disadvantage in relation to them.

Mr. James Yates, F.R.S., said—The first question was (in reference to the present method of reckoning measure, weight, and money), whether decimal notation should be extended. Hence it appeared important to know to what extent decimal notation was at present used. Its use was so very rare, that to adopt decimal notation as the basis or principle of a system of measures, weights, and coins for this country, would require an almost total abandonment of the existing methods. In our tables there were about 30 different multipliers, of which 10 was used three or four times; 20, 40, 50, 60, and 100 were but very rarely. The other numbers, such as 2, 3, 4, 5, 8, 12, occurred much more frequently. The present practice was, therefore, about as far removed from anything decimal as it could possibly be. The only cases of strictly decimal notation, so far as he (Mr. Yates) could discover, were these:—In dry measure 10 quarters = 1 last; in measures of length, 10 chains = 1 furlong; in superficial measure, 10 chains = 1 acre; and by the law for the sale of coals in London, 10 sacks = 1 ton. It was, therefore, manifest that any scheme for decimalising the measures, weights, and money implied an entire subversion of the present usages, and the substitution of something quite new in its place. But was this a valid reason for not making the change? No. It only proved that we must aim at an entire and radical change if change were made at all. The opponents of the decimal system were in the constant habit of insisting on the necessity of binary division, as if the decimal system made no provision for it, and as if its advantages were confined to the existing method. It might be true that in some parts the English method used the number 2 in multiplying and dividing more than the decimal method. The most remarkable instance was in dry measure; thus—4 gills 1 pint, 2 pints 1 quart, 2 quarts 1 pottle, 2 pottles 1 gallon, 2 gallons 1 peck, 4 pecks 1 bushel, 2 bushels 1 strike, 2 strikes 1 coomb, 2 coombs 1 quarter, 4 quarters 1 chaldron. He shewed that there were 11 denominations, for producing which the multiplier 2 was used seven times, and 4 three times. After that the system became partly decimal—5 quarters 1 way, 2 weys 1 last. The example quoted, instead of recommending binary division, appeared to him (Mr. Yates) fitted to produce quite the opposite impression; for he thought any but the most insignificant calculations, founded on it, must be perplexing and laborious in the extreme. The number 2, though indispensable for the smaller and subordinate divisions, was much too low to constitute the principal divisions. But 10 as a factor, compounded of 2 and 5, admitted of the use of the three numbers in their just proportion, and with the greatest possible convenience and advantage. In transcribing upon paper any amounts of weights, measures, or coins, persons arranged them all decimally, but in the preliminary operations of weighing and counting, they called to their assistance the quantities which were stated not only by tens, but by twos and by fives. The authors of the Metrical System were, from the beginning, perfectly cognisant of this fact, and one of the fundamental provisions of the system was based upon it. Every principal quantity, every money of account, and every weight and measure which had a distinct denomination, had its double and its half. Yet there were persons in this country, regarded as high authorities, who fancied that in using the decimal system, we must always multiply and divide by 10. Mr. Yates produced a complete set of the franc and centime system, to his mind the most perfect decimal system of money in existence, and the most extensively adopted. It consisted of 19 pieces. Taking any of the principal pieces) he was able to show its double and its half, and to show them in one coin. But besides this, these sums might be bisected, and the bisections represented in coins to a great extent and in various ways. The most extensive bisection was the following:—Piece of 80fr., 40fr., 20fr., 10fr. 5fr., 2fr. 50c., 1fr. 25c. There were, thus, seven steps, and only in the last was it necessary to make use of two coins to represent the sum. On comparing the franc and centime system with the present English coinage, and taking into account both the binary divisions in each, and the number of coins necessary to represent those binary divisions, he found that the franc and centime system had the advantage; for the halves were represented, in proportion, by a smaller number of coins in the metrical than in the English system, showing that, of the two systems, the metrical accorded more with the binary division. With respect to linear measures, the double-metre might be taken as useful for measuring brick-work, and similar purposes. Its half was the metre; the half of that, 5 hands, or decimetres; the half of that, 2½ decimetres; the half of that, 1¼; and the half, 62½ millimetres. There the binary division stopped, so far as it could be easily represented to the eye; the scales did not, so far as he knew, go lower than the ½ millimetre, but this was in common use, being perfectly visible and very convenient. The commencement might have taken place with the myriametre, the highest linear measure, which, in the French system, was denoted by a distinct denomination, and it would be seen that this measure might be bisected 8 times.—10,000 metres, 5,000; 2,500; 1,250; 625; 312.500; 156.250; 78.125; 39.062,5. In like manner he (Mr. Yates) might proceed to discuss the weights of the metrical system, and to show how well they were adapted to binary division. The metrical ton admitted of bisection ten times, thus:—

Kilogrammes.	Ton.	Kilogrammes.	Ton.
1000.000 .... =	1	15.625 .... =	$\frac{1}{64}$
500.000 .... =	$\frac{1}{2}$	7.812.500...... =	$\frac{1}{128}$
250.000 .... =	$\frac{1}{4}$	3.906.250...... =	$\frac{1}{256}$
125.000 .... =	$\frac{1}{8}$	1.953.125...... =	$\frac{1}{512}$
62.500 .... =	$\frac{1}{16}$	976.562.5 ... =	$\frac{1}{1024}$
31.250 .... =	$\frac{1}{32}$		

He might proceed to show the advantage belonging to the same system in regard to its divisibility by 5. This followed as a necessary consequence from the facts already stated. Divide any of the principal amounts by 5, and the double of the principal amount below was at once obtained; or multiply that lower amount by 2, and the fifth part of the higher amount was obtained. Thus, 5 came in as a factor just as readily as 2. On the other hand, 3 did not suit this or any other decimal system. Division by 3 produced in many cases a repeating decimal, which was embarrassing, and prevented perfect accuracy in reckoning. So far, therefore, as regarded divisibility, he found that taking the metrical system as an example, the decimal method had the advantage over every other, so far as regarded the use of the numbers, 10, 5, and 2; but that it failed in regard to 3. If, therefore, it were possible to invent any system based on the number 3, which would be eligible in all other respects, the comparative merits of the two would depend on the circumstance whether 3 or 5 was the more important number. If a decimal method be chosen, 3 must be abandoned as a leading number; if a duodecimal be chosen, 5 must be abandoned, and reckoning must take place altogether by multiplies of 2 and 3. Now, in his (Mr. Yates's) opinion, 5 was quite as convenient as 3, and as often required in practice. In respect to binary division, decimal methods were at least on an equality with any other.

Mr. Ayres remarked that in one of the letters which had been read an opinion was expressed by the writer that bankers and merchants would not be inclined to adopt the system of decimal notation. His (Mr. Ayres's) opinion was that the value of decimal notation was thoroughly appreciated by the two great classes mentioned. He thought the discussion of this first abstract proposition was inseparably connected with the second point, viz., What should be the unit? upon which, probably, some difference of opinion existed. He coincided with Mr. Miller in his remarks as to the value of decimal notation, and as to its application in the Bank of England to the weighing of gold, but he thought the system there adopted would scarcely be applicable to weights and measures generally. He did not for a moment say that the system was not convenient for the Bank of England, because he had heard from Mr. Haggard that it was a saving of much time and labour. He believed there were some few errors in the report of the commissioners, one of which was in Mr. Yates's division of the pound sterling, which was there stated not at 20 but at 27. He thought the division of the pound into 20 might be adopted, which again admitted of further subdivision. He thought, if the objections made to the decimal system were fairly met by those competent to deal with the subject, they would very soon find the system adopted in schools as well as in the counting-house. There were some objections to the introduction of the system. They had aged clerks who were wedded to the old system, and they had ignorant people to deal with, who had been all their lives accustomed to the division by the half and the quarter. At the present time decimals were used only by men of education. Upon the first proposition he would say he considered the system of decimal notation ought to be extended.

Mr. R. Dawbarn supported the system of decimal notation, which he said had been well described by Mr. Miller, as being interwoven with our very nature. He would express a hope that the time had arrived when the introduction of a system would no longer be delayed.

Mr. R. R. R. Moore said—Before the first proposition was put to the meeting, he should like it to be well understood what was meant by the decimal system, as there were some who seemed to think that some other number than ten might be introduced. For his part he could recognise no system as a decimal system but one progressing by tens, a system which carried them through everything with common arithmetic. It was amazing that a country like England, with a people so eminently practical, carrying on the largest mercantile transactions of any nation in the world, should continue to maintain the most complicated and most unintelligible system of arithmetic that was to be found on the face of the earth for all business calculations, and which, in the education of youth, was a serious obstacle to the ready acquisition of knowledge. It wearied the brain and disgusted the learner. Therefore, when he said it was desirable that the use of decimal notation should be extended, he wished it to be clearly understood that by the decimal system he meant the all-ten system—nothing but tens, hundreds, and thousands—the system of common arithmetic which was purely decimal. He denied that there was any other system of decimals, and he should support it for the purpose of simplifying the education of youth; and he was sure the generation now at school, as well as future generations, would bless those who carred it out.

Mr. Vignoles said, having read almost every publication that had appeared on this subject, it seemed to him that as regarded the great mass of the people there was a mystery about decimal notation which it wanted only a few words to explain. As to decimals they were nothing more than the common addition, multiplication, subtraction, and division, which every child learnt in its first lessons in arithmetic. In fact, the whole system was merely learning how to place the decimal points.

Dr. Booth considered that a great deal of the difficulty with regard to decimals with the humbler classes, consisted in the place in which decimals were introduced in the ordinary arithmetic books. Practically speaking, decimals were a part of the first rules learned by a child when he computed by tens, hundreds, thousands, tens of thousands, and hundreds of thousands. The child was taught numeration to the left of the point. He had only to be taught to carry out the system to the right of the point, and he would then become practically acquainted with the use of decimals before he entered upon the common rules of addition, subtraction, multiplication, and division. It was absurd to defer instruction in decimals until the pupil became advanced in the higher rules of arithmetic. It was part of the very first rules, and if treated as he had pointed out all difficulty would disappear. The necessity for the transformation of vulgar fractions into decimals, arose from their not having a decimal system of money, weights, and measures.

The Chairman said he gathered from the tone of the meeting, that they affirmed the first proposition, viz., That it is desirable to extend the use of decimal notation; and that being the case, he would ask them to come to the discussion of the second point.

General Sir Charles Pasley, K.C.B., said there was much misunderstanding as to the difficulties of adopting a decimal system of coinage and of weights and measures. The decimal system commenced with one, and went on by tens, hundreds, thousands, and tens of thousands, and with a decimal division of coins, weights, and measures, there would of necessity be no fractions. In a decimal coinage for this country, the unit should be the thousandth part of a pound sterling, and there was no need of a lower coin. Accounts would then be kept in pounds, florins, cents., and mils, and as regarded weights and measures, in units, tens, hundreds, and thousands, instead of the present absurd mode of tons, cwts., qrs., and lbs., which had no systematic reference to each other. It had been well observed, that more difficulty was made about the use of decimals than there was any necessity for. They got rid of all fractions by adopting the natural number of ten. Instead of compound addition, subtraction, multiplication, and division, they would have simple addition, subtraction, multiplication, and division of common numbers. With regard to the unit of account, he thought it was evident that the pound sterling was the best unit by far, as it was capable of division into florins, cents, and mils; into tenth, hundredth, and thousandth parts, and he thought that was as low as it was necessary for any coin to go. To go below the farthing or mil he thought was absurd.

Mr. Beard thought, in the establishment of a decimal system of coinage, it was desirable to take the lowest unit they could find, as they would then do away with decimal fractions.

Mr. Franklin advocated a return to the first principle of counting by tens, to be applied to mensuration of all kinds. The question was, whether it should be applied to coinage. He hoped whatever unit was agreed upon it would be consistent with our present coinage, whether it was the pound or the penny.

Mr. Yates suggested the franc as the better unit.

Mr. Franklin hoped the question would be raised as to whether the decimalisation should be with our present coinage, or upon the system of foreign nations.

Mr. Vignoles remarked that it appeared to him quite clear that the unit should be that which, according to his notion of a great commercial people, was the most convenient. England would naturally take the pound sterling, Prussia adopted the rouble, France the franc, America the dollar, all of which were independent coins upon the decimal system. As they were agreed upon the utility of the system, their object should be to agree upon the most convenient unit, and that was purely a commercial question. It was quite taken out of the category of theory; the question was, what was for practical purposes the best unit of account. The Portuguese went to the bottom of the scale, and took the milrey, or the thousandth part of the rey. Russia took the rouble divided into 100 parts, down to the copeck. France took the the franc downwards. It would therefore be for England to take the pound sterling as the commercial unit of value, and go down to the lowest coin—the thousandth part of the pound. He submitted that this was the great question for a commercial people to consider, and therefore it was taken entirely out of the hands of the theorist, and must be dealt with by practical men alone.

Mr. Francis Bennoch, as a practical man, would offer one or two observations on this subject. He thought there could hardly be two opinions with regard to the adoption of the pound sterling of the country as the unit of account. All salaries, from the highest official to the lowest clerk—in fact salaries of every description in the mercantile, as well as the official world, were stated in pounds sterling, until they came down to the cases of weekly wage: whenever they went beyond the weekly pay they quoted the pound sterling. The taxation of the country embraced so many pounds sterling to be raised, and to be paid by the people. The National Debt was stated in so many millions of pounds sterling. Then, again, all contracts were expressed in pounds sterling: in fact it was so ingrained into our commercial, political, and social system, that any attempt to separate it from the national mind, and to introduce a foreign system of currency into this country, would be a more difficult task than perhaps some imagined. He did not think a silver unit could for a moment be entertained. How could they express the national debt in shillings, and if they adopted the penny as the unit of account, they would be still more at sea. This was a subject which must be dealt with seriously. It was to be expected that those present had thought over this question and had come there to enunciate their convictions after mature deliberation. Nothing was easier than to adapt the pound sterling to the simple principle of a decimal system. If it was divided by 2, they had the 500, which combined the binary system with the most exact decimal system, and brought into operation every coin now in use, with the exception of the half-crown and the fourpenny-piece. They had the thousand mils making the sovereign, the half-sovereign or 500 mils, the crown making 250 mils, and also the florin, which was the first great division of the pound. They retained the shilling or half-florin, and the sixpence or quarter florin, and a tenth coin of ten mils, which was perfectly easy to be understood. They had four distinct steps, the sovereign, the florin, the cent, and the mill being coins of account, all others being coins of convenience; and there was no alteration required in the present coinage, except the introduction of one other coin to complete the system. Further than that, their present style or system of book-keeping and books would require no alteration in ruling. The column now used for the pounds would remain for the pounds; that for the shillings would remain for the florins; and that for the pence and farthings would answer for the divisions of the 100. It would be a difference of nomenclature rather than a difference of principle. Looking, therefore, at the whole plan, which he had done from beginning to end, commencing with the boy with his farthing up to the merchant with his pound, he held that each would be benefited by such a system. It had been asserted by some, that the poor man would sacrifice a certain amount of advantage in regard to the purchases he made with his mils. That was a great fallacy, because, if they divided the sixpence into 25 parts instead of 24, the chances were that the 25th part (a mil) would purchase as much as the 24th part (a farthing) had done before; and, instead of being a disadvantage to the small dealer, it would be an advantage to him of 4 per cent. He was convinced in his own mind that the pound sterling should be the unit of account adapted.

Mr. William Brown, M.P., said, that as many present were aware that he had taken an active part in this subject, he might state the progress that had been made in it—viewing it as a commercial question—since the year 1852. The Chamber of Commerce of Liverpool memorialised the government in 1852 to adopt the decimal system of coinage, taking the pound sterling as the unit, considering that it would facilitate the commercial transactions of the country. Prior to that period a Royal Commission had reported that a decimal system would be incomplete without the pound as the unit. Another Commission similarly reported in 1853, which Commission urged upon the government not to go on with the coinage of copper money, because in the adoption of the decimal system, taking the pound as the unit, a copper coin of a lesser value would be required. In 1852, finding that the government were not moving in the direction wished, he (Mr. Brown) moved for a committee of the House of

Commons. That committee made a unanimous report that the pound sterling was the best unit of account that could be adopted, on the ground mainly, that it would involve less alteration of the current coin than the adoption of any other unit. They need make hardly any change in the coinage except in the copper, and that would be only 4 per cent. less than it was now. Before the committee to which he had alluded, persons in the habit of dealing with the poorer classes were examined, who spoke of the fluctuations in the prices of numerous articles being such as that they were obliged to accommodate the quantity of the article to the money they received for it; and the poor understood perfectly well how far their money would go, whether it was a penny or a pound. He (Mr. Brown) ultimately brought the subject before the House of Commons, and the government were beaten by a majority of 3 to 1—not because they were hostile to the principle, but because there seemed to be an indisposition to move in the matter. In order to get rid of the importunity, they appointed another Royal Commission, which was now sitting, and he had reason to believe, that at least a majority of that commission were in favour of the pound sterling for the unit. Lord Overstone had put forth a great number of queries, which he believed had been answered by persons competent to do so; and he (Mr. Brown) very much questioned whether the noble lord had not been led to alter his views in some respects upon this question. With regard to the extending of the decimal system to weights and measures, he (Mr. Brown) had originally framed his motion in the House of Commons so as to embrace the whole question, but on the suggestion of the then Chancellor of the Exchequer, Mr. Gladstone, and under the advice of the late Mr. Joseph Hume, it was considered more prudent to limit the motion in its application to coinage. Mr. Gladstone expressed his opinion that if the principle were carried with regard to the coinage, it would follow as a matter of course with regard to weights and measures. Subsequently to that a Decimal Association had been formed, from which many publications had emanated in support of the pound as the unit. That was the position in which the matter now stood before the Royal Commission. From all the opinions he had gathered from the mercantile and commercial bodies of Liverpool, they were decidedly in favour of a decimal system of coinage, taking the pound as the unit. In addition to this there was a petition to Government, signed by 1,200 merchants of the City of London—perhaps the most influential petition that was ever got up—recommending the pound as the unit, and asking for the establishment of a decimal system upon that basis.

Mr. Matthew Marshall said—They had been accustomed to hear on these occasions warm advocates of what was called the poor man's penny. As this was a free discussion of opinions, he hoped if any advocates of the penny system were present they would state their views.

Mr. Mossom Meekins concurred with Mr. Brown in thinking that the decimal system should be extended to monies in the first instance rather than to weights and measures, if its simultaneous adoption in all were found impracticable. The people would more quickly learn the use of a decimal system when applied to money than to either weights or measures, as they would necessarily be brought into daily contact with it. As to what should be the unit, he (Mr. Meekins) was in favour of an international system of monies, and in selecting the unit he should incline to that which offered the greatest facilities for international uniformity. When one looked anxiously into the subject, it was surprising how few obstacles stood in the way of the adoption of an international system. If England, France, and the United States could agree on one system, the other nations of the world must ultimately adopt it. The gold coinages of these countries very nearly approached each other in value, without being precisely commensurable. The English sovereign contained 113·001 grains of fine gold, a French 25 franc piece would have 112.009 grains fine, the American or 5 dollar piece had 116.1 grains fine, worth respectively 20s., 19s. 9·8d., and 21s. 6·6d. The whole difference between these values was under 9d. But for this slight discrepancy the coins of each country might pass current in both of the others, with what advantage to commerce was sufficiently obvious. To accomplish this result he did not think that the United States would refuse to lower their gold 5 dollar piece by 6½d. They had lately adopted a gold standard in that country; besides, the value of the dollar had been repeatedly altered. In 1792 a 5-dollar piece contained 123·25 grains fine, equal to 21s. 10·83d.; in 1834 it was reduced to 116 grains, nearly 20s. 6·4d. sterling; and in 1837 it was raised to 116.1, or 20s. 6·6d. sterling. If, then, the Union would go a step further, and lower their half-eagle 6½d., we should have exact international equality. Then a large number of English sovereigns were current in the Union; in fact, till the beginning of this year, they had been a legal tender at a fixed rate, and even now practically they were never refused in payments; thus the change would be much more readily accomplished in America than here. The English standard had been settled since 1816—and there would be difficulty in disturbing it, besides no American coins were current here. But it might be urged, that national prejudice in the Union would be opposed to the adoption of our sovereign as the datum for their dollar; this difficulty might be got over, by our consenting to adopt their dollar and cents, in our coming change, to a decimal system. Thus the standard and value would be British, and the system American. In regard to France, the difficulties that impeded perfect international uniformity were perhaps less. A 25-franc piece would differ from the sovereign by little more than twopence; if France coined a twenty-five franc piece, raised its value twopence, or twenty-two centimes, and gave up her trifling seignorage, exact equality would be secured. As to the seignorage, he did not anticipate much difficulty—it had been lowered one-third in 1835, and was now six francs per kilogramme of gold. He thought that the advanced and enlightened views of the Emperor would lead him to do away with it, on the ground of a seignorage being condemned by political economists. Some advantages, he thought, would accrue to France from the adoption of this course. By raising the value of her gold coinage, it would tend to keep silver in that country, which at present was flowing out with unexampled rapidity. France was just adopting a gold standard; the English sovereign was current, and was rarely refused, and its adoption as a 25 franc piece could unsettle no contract in that country. Many of the ablest Frenchmen had declared their willingness to reconsider their beautiful metrical system, so far as their monetary integer, the franc, was concerned. If, then, France, with that cosmopolitan generosity which distinguished her present policy, were, in unison with Britain, to adopt the dollar and cents, based upon the pound sterling, this would give a complete international decimal system of monies, so far cosmopolitan that one-third of the human race might be embraced in its benefits. He (Mr. Meekins) regarded it as puerile to talk of international uniformity unless the assimilated coinages were in the same standard metal. He (Mr. Meekins) had shown at Questions 797 and 801, in his evidence before the Decimal Coinage Commissioners, that all our present domestic coinage could circulate, under this proposed change to dollars and cents, by lowering our copper coinage four per cent. Now, no complaint would be made by the poor to this; so far from being unpopular, the lowering of the token coinage was likely to be popular, as the people would imagine that they gained ½d. on every shilling. It was when the token coinage was raised in value, as in the case of Ireland in 1826, and the Isle of Man in 1840 (the one 8 and the other 16 per cent.), that the people thought they lost respectively 1d.

and 2d. in the shilling. Mr. Slater said in his evidence, that if we had an international system, the variations of exchange would alter the identity of value. The opponents of international uniformity kept constantly harping on this point. He (Mr. Meekins), with great deference, felt sure he could prove that the variations of the exchanges could not in the slightest degree interfere with an international system. Corn, like gold, had different values at different places, but was that any reason why, in determining its quantity, the same weights should not be used in every place. Coin fell under the same predicament. The mint stamp on coin was merely *prima facie* evidence of its containing a certain quantity of fine gold; rebut that evidence by weighing it, and it was no longer a legal tender. But what was the fact? The rate of exchange varied between London and Dublin just as it did between London and Paris, but did that prevent the multiplied advantages that accrued to England and Ireland from the same coinage circulating in both countries. Again, the rate of exchange, perhaps, varied more between Genoa and Paris than between London and Paris, but did that prevent both France and Sardinia from reaping immense benefits from the uniformity of their coinage? The rate of exchange varied between St. Petersburgh and Odessa, ought Russia, therefore, to have different coinage for those two places? But, were France to adopt the dollars and cents based on the English pound, she might well require some return for this graceful liberality on her part. He thought the return they were bound to make was obvious, if return it could be called, that would redound most to our own advantage, viz., the adoption by England and America of the unrivalled French system of weights and measures. Thus, a complete international decimal system of monies, weights, and measure would be secured. In conclusion, he expressed his opinion in favour of such a system, because it would afford infinite facility to commerce, it would effectually expediate the operations of foreign merchants, it would effect an incalculable saving of valuable time and labour, and would diminsh the liability to error in accounts; it would simplify foreign exchanges; it would save the necessity of constant re-coinage; it would singularly simplify the study of comparative statistics, and incredibly facilitate generalisation and mental assimilation—it would shorten the period of education, and could not fail to increase and secure the comity of nations. The realisation of objects of such transcendant importance might well command the earnest energies of able men.

Professor de Morgan said, it was an important part of the question in settling what should be the unit of account, to consider whether they should have a national unit or a universal unit. It was true they might, at great trouble and expense, enable those who travelled on the continent, and those who had to calculate the rates of exchange, to do their work a little more easily to themselves. The question of international coinage, he considered, was not practical. They could not get the government to move to introduce an extra farthing into our present system, and did they suppose that government would stir in the matter to get France and America to join in a system of international coinage which would affect the great commercial interests of the whole world? And in what time might they expect this to be accomplished? Supposing such a thing were to happen, they could not expect it to be accomplished within the next five-and-twenty years at least. He thought the first step was to decimalise the pound sterling in the manner that had been proposed. It might be argued that there were two advantages attending upon a universal international coinage; in the first place there would be an international principle of division, and in the next place there would be the same thing to be divided in one country as in another. But these were separate matters, and he had called upon the advocates of international coinage to discuss them separately. It was his firm belief, that nine-tenths of the advantages that would arise from the decimalising of an international system, would not be from the fact of having the same coins to divide, but from having the same mode of dividing them; therefore, as a great many nations divided their coins decimally (and many more would, no doubt do so, if Great Britain adopted the plan), he contended that they should adopt the old English mode of doing what they could as soon as they could, and decimalise the pound sterling. He would say, with regard to the rates of exchange between this country and France, if they gave both countries a decimal coinage they did the most that could be done; and in other respects, it was, in his opinion, better to keep the coins of the two countries distinct, than to have them very near to each other in value. They were aware that there were many things which a mathematician might study for a number of years and get very profound in; but there was one thing in which he was very likely to make a mistake—that was in the use of plus and minus; and La Place was as likely to fall into that mistake as the youngest of his (Prof. de Morgan's) pupils. With regard to the question—what should be the unit of account? the point was just this; it was difficult to settle by logic what the unit should be; it must be settled by experience and by practice. He would ask, was there ever such an accumulation of evidence as had been already given in favour of the pound sterling as the unit, against anything else? Some 24 years ago, he had arrived at the conviction that the pound and mil system was the best, and that which he should like to see carried, but he thought it would be impossible to get the men of business to agree to its adoption. On conversing with men of business he found that they had no objection whatever to a decimal system; but they, one and all, contended for maintaining the pound. The commissioners upon weights and measures came to that opinion at once. The House of Commons took up that conclusion as a matter of course, and the committee of the House of Commons, as well as the House itself, arrived at the same conclusion. The 1200 memorialists of the City of London came to the same conclusion: "for," they stated, "the pound sterling is a fixed unit, and must be retained." They took that bold course—not that "your petitioners will ever pray," but "the pound must be retained." He repeated that international coinage was impracticable; an association had been formed in support of that plan, which, he believed, owed its vitality abroad to the fact of its favouring the adoption of the French system, without any alteration at all. With regard to the penny system, he expected that some fight would have been made by its advocates before the House of Commons, and that he should have had something rather stiff to answer. But one said he had given up the idea—another said he had not been used to decimal calculations, whilst another grounded his support on the idea that the end and aim of arithmetic was shortness of expression, rather than brevity of calculation; so that, from the withdrawal of some, and the lukewarmness of others, he looked upon the penny system as defunct. The real question was between the present system and the pound and mil plan. They had affirmed the proposition, that it was desirable to extend the use of decimal notation, and if it were not to be extended to money what was it to be extended to. With regard to the adoption of the pound sterling as the unit he repeated that they had a great weight of evidence in its favour. They could not adopt any other unit without calling in the present silver coinage, and no one, he thought, would be prepared to propose that. All parties were for keeping our present silver coinage. The advocates of the penny system would introduce the French gradations; and as to the advocates of international coinage, it was not clear what they would do, but he apprehended they would be for putting the shilling into the melting pot.

Mr. Meakins said he would keep the shilling.

Professor de Morgan.—They could not set a poor man to calculate in tenpences and talk of francs, whilst he paid a shilling. No Act of Parliament could make him do that; therefore, the poor man must have the coins in use with which he calculates, and it would be a long time before there were sufficient francs to drive out the shillings. In the system in which the pound was preserved, the poor man would still have the monies in which he was accustomed to calculate, and would still have those monies to receive and pay, viz., the pound, the florin, and the cent, whether in copper or bronze; he would have the tangible money as at present in use, for he would never have learned the present system unless he had seen the penny, the sixpence, and the shilling. All these arguments put together went more and more strongly in favour of the pound; in fact, he thought it almost unnecessary to argue the question further. His own opinion was, that it would be the pound decimally divided or nothing at all, and that the whole question lay between the two things.

A vote of thanks to the Chairman having been proposed by Mr. Wm. Brown, M.P., and seconded by Professor De Morgan, was carried unanimously.

The late hour of the evening to which the discussion on the first two points was prolonged, rendered it impossible to take up the third point, which was therefore adjourned for consideration at a future meeting.

SECURITY FROM FIRES IN THEATRES.

At the time of re-constructing the Theatre l'Odeon' after its destruction by fire, it became a question whether a metallic screen should not be interposed at the proscenium, between the audience part and the stage, for the purpose of preventing the rapid communication of the combustion of the parts behind the scene, or upon the stage, to the body of the theatre. M. D'Arcet strongly opposed the use of an impermeable screen, but recommended one of wire, and founded his opinion on the following facts, which, if generally know, might tend to give a degree of self-possession to the public, in a theatre, should they ever be called upon to act in such a critical situation. "I had occasion accurately to observe the first destruction of l'Odeon, by fire, in the year 1799. I then remarked that the fire spread rapidly behind the scenes, but without any smoke appearing in the body of the theatre; and I was able to remain, for a long time, in one of the second tier of boxes on the left side, without being inconvenienced by the heat, and having nothing as a protection but the powerful current of air which passed through the theatre, and proceeded to invigorate the combustion of the scenery and woodwork upon the stage. Nearly the whole of that part of the theatre was on fire, but the public portion quite untouched, when a piece of inflamed wood fell on the left side of the centre, rebounded over the balustrade, fell into the orchestra, and then set fire to one of the benches in the pit. The combustion of that part thus commenced, but the current of air towards the stage was so rapid, that the smoke passed nearly horizontally towards it, and the fire made but slow progress in the pit. I witnessed this effect for more than half an hour, and beheld the whole of the orchestra, and nearly the whole of the pit in flames, without their being any sensible portion of smoke in the body of the theatre, above the first tier of boxes. I was then obliged to work at a pump, and prevented from observing any longer the progress of the fire."

M. D'Arcet then observes, that the impermeable metallic screen would, in any such case, have done far more harm than good. "Supposing it strong enough to withstand the pressure of air upon it, it would quickly become red-hot, and from causing the ascent of a current of highly-heated air on its side towards the body of the theatre, would, in every way, tend to inflame that part of the building; it would also confine the air there, and in a few moments make it unfit for respiration. On the contrary, an open metallic screen, with large meshes, would appear to present great advantages; the air would pass freely, and, consequently, exert no serious degree of pressure upon it; the screen itself would be preserved cool by the rapid current going through it; inflamed pieces of wood, when falling, would be retained on the side already in flames; the firemen could throw water through it upon the burning places on the opposite side; and none of the inconveniences would be occasioned by it, which so evidently belong to the impermeable screen."

WASTE IN WOOLLEN FACTORIES.

The Hawick correspondent of the *Edinburgh Express* writes:—"To those who are acquainted with the process of woollen manufacture it is needless to say that a considerable portion of the raw material—wool, oil, soap, and natural grease of the wool—goes for nothing, and is either thrown to the dunghill or run into the river as "waste." At one time there was more "woollen waste" sent to the dunghill than now, for there are a number of "waste merchants," who buy up everything like wool, and send it up to Yorkshire to be made into "shoddy", or "mungo," which is again mixed with new wool, spun into yarn, and made into good broad cloth, doeskins, or thick pilot cloths; hence the Yorkshire shoddy cloths are so cheap-looking in comparison with Scotch Tweeds, which are made of new wool. But it is proper that no materials should be wasted; and the Yorkshire manufacturers have the credit for making use of what was formerly thrown away as dung. There is, however, still some mill waste which cannot be used up again for "shoddy." It is that portion of the wool waste which is so saturated with oil and grease that the fatty matter is heavier than the wool in it; it is called "creash." This has been turned to little account hitherto, farmers having got it for little more than the trouble of carting away from mills; but it has now been discovered that it is one of the most powerful manures that can be laid upon land. Those farmers who laid it upon their land several years ago are seeing the advantages of every succeeding year; for it does not give out its strength to the crops all at once, though, by a chemical process, it could be made to yield its nourishment at once, and be as good as guano to the enterprising agriculturist. We would also recommend to the attention of the agricultural chemist the quantity of "liquid manure"—namely, the soap suds, &c., which runs to waste from the mills. This liquid refuse contains the best fertilising elements which can be found; indeed farmers are in the habit of paying £7 a ton for substances which can do less good to their crops than despised "soap sud" would do. If soap suds could be reduced to a solid manure (in doing which there would be little difficulty), then the manufacturers might contribute to the fertility of the soil. Besides the use to which "mill-waste" and "soap-suds" can be applied by the farmer, there is another use for soap-suds; the grease can be extracted from the liquid, and again made into soap of inferior kind. The process has been carried on profitably in Yorkshire for some time back; and now several parties are in the field anxiously contending for obtaining contracts with the manufacturers of this district for collecting "soap-suds" at the various factories, for transforming the "sud" into soap once more. The manufacturers are making all necessary inquiries into the matter in the meantime, previous to entering on any engagement with an English company."

Home Correspondence.

ON LIQUID SEWAGE MANURE.

Sir,—If Mr. Sidney's other facts are as incorrectly stated as those with which he has connected my name, his communication can have little value. He states that my crops are not better than those of my neighbours, quoting as my neighbours farmers who live in a rich valley six miles from my farm. My neighbours are those whose various fields adjoin my own on every side; their crops this year, as well as others, are inferior to mine in about the following quantities per acre:—Wheat 1½ qr.; oats, 3 to 4 qrs.; barley and beans in similar proportions, whilst my hay and clover are very far beyond theirs in production. I should prefer not mentioning these differences, but I sacrifice my feelings to my public duty. Although on a poor heath, my crops will bear a comparison with those of the rich valley lands, and I confirm Mr. Chadwick's statement that it is greatly owing to the application of liquified manure. All the solid manure that falls from bullocks and pigs through the spars is applied in a fluid form, being largely diluted, and had I another great tank not a particle should go in a solid form. To doubt the value of liquid manure is to ignore 13-14ths of all manure. Professor Way stated that human excreta were in the proportion 3½ lbs. fluid to ¼ lb. of solid—the former containing nearly all the ammonia and soluble phosphates. The same proportion will hold good for animals. Mr. Sidney's statement that my mangel had benefited by super-phosphate is a great mistake;—true it was applied—but on my clay lands it failed to give any addition to the crops. I suppose the land already contained enough.

Some idea may be formed of the value of liquified manure applied with large quantities of water to pasture, from the fact that five acres of grass, opposite my house, almost starved a couple of cows which would scarcely eat it. Now, since irrigation, the same animals and many others derive rich nourishment from the same soil—a new class of grasses has sprung up, and the milk, cream, and butter, are rich and abundant.

It is a great mistake to suppose that liquified manure does not benefit wheat. It is precisely the manure required, but then wise farmers would naturally apply it during spring and summer to the green and grass crops which precede the corn crops.

I, for one, feel deeply indebted to Mr. Chadwick and those who have so much enlightened us on the subject. The question is now resolved into one of time and belief.

In spite of the Sidneys of other days, gas, steam, and the electric telegraph, and other once-called "impossibilities," have resolved themselves into acknowledged truths. So will, ultimately, the conversion of our manure into our food.

J. J. MECHI.

Tiptree-hall, Kelvedon, Essex, July 20, 1857.

THE APPLICATION OF THE SEWAGE OF RUGBY TO AGRICULTURAL PRODUCTIONS.

Sir,—I consider that it would be extremely unfair to Mr. Walker, the owner of the works for the application of the sewage of Rugby to agricultural production, if, in his absence, I were to allow to pass unnoticed statements so couched as those of your correspondents, made, for ought that appears, without Mr. Walker's authority, founded, probably, on loose answers, and without any knowledge on his part of the purpose for which they might be used. I must request, as due to the important subject, as well as to Mr. Walker, that his own account of the principle of the works and of their action should be given fully in his own words, which I apprehend will convey a far different impression to that which would be created by the reputed verbal statements of himself or of the tenant farmer. The account was written by Mr. Walker, in answer to some depreciating statements of the like effect of those of your correspondents, promulgated in a publication for the promotion of certain professional or trading interests, which statement, asserted as a fact (what, in one of the papers published in the Society's *Journal* and elsewhere is assumed to be a necessary consequence), that the fields manured at Rugby smelt offensively, and those statements also maintained the superiority of the plan of dealing with the sewage by the manufacture of precipitates in use at Leicester. Mr. Walker directed my attention to his answer contained in this account, which, I may observe, is much the same that he gave at Paris in our audience with the Emperor, when he stated further that the interest on his outlay,—which he thought in new works might be greatly reduced,—rent of sewage, coals, labour, and all expenses, amount to £1 per acre. For those expenses he, on the average, distributed on each acre, 100,000 gallons per annum. I ommitted to state that he subsequently forwarded to me to show in Paris specimens of wheat grown from sewage manure alone, and also specimens of wheat grown on the same or the like soil, under the ordinary mode of culture, and that the contrast of those specimens was fully corroborative of the statement made to me in respect to his growth of wheat. Mr. Walker, writing to the editor of the publication referred to, and noticing the errors as to the details of this apparatus, and the results produced by it, says—

> It is, only in so far as those errors affect your conclusion averse to the principle of the distribution of town sewage in a liquid state, that I will trouble you with any corrections in detail. I may mention, however, that I have not 11, but about 5½, miles of iron pipes branching from the neighbourhood of my steam-engine, like the fingers and thumb of an out-spread hand; and of this quantity 9-10ths are of 3 inches diameter, not 6 inches. I have not 750, but about 470, acres operated upon; and the cost of the works has been, not £5000, but about £3000; or 7s. 9d. per head of the population of Rugby, instead of 12s. 6d., the amount you mention.
>
> "I may further assure you, that the 12-inch inlet pipe has never been found too small, though, from its very slight incline, and from accidental circumstances, it has occasionally been clogged up, as a larger one would probably have been more frequently. And as to the distributing pipes (1½-inch gutta-percha tubing), I still, after two years' experience, think them the best for general use, as larger ones would be too expensive and too unwieldy—though on grass land I find it convenient to have some 2¾-inch tubing as a kind of moveable main, from which the smaller pipes for distribution bifurcate.
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> "The errors of construction, then, which you point out, have no existence; though I admit that I paid the usual penalty of introducing new apparatus, in sundry mistakes, which have since been remedied; but of these almost all were attributable to my having acted upon the advice of a "regularly qualified engineer," who, if I had followed his guidance to a greater extent, would have led me to throw away a vast deal of money on works which would have been worse than useless.
>
> "The points, however, which you make against my system are in the main twofold: 1stly, that it is objectionable in a sanitary point of view; and, 2ndly, that it is more expensive than the method of extracting from the sewage its manuring ingredients in a solid form, *e. g.*, that of Mr. Wicksteed, at Leicester.
>
> "In support of your first objection, you say, that when you visited Newbold "the smell over the whole district was decidedly unpleasant." I do not know when your visit took place, nor what special circumstances, either local or personal to yourself, could have given you the impression, but I most unhesitatingly and explicitly deny that the sewage watering has at any time produced any such effect. I assert that, even on the spot, when the watering is taking place, you will generally smell nothing, never anything really offensive, and that after the lapse of a couple of hours, or at a distance of 200 yards, you will never perceive any unpleasant odour; that the objection on this score is as nothing to that which might be urged against the practice of spreading solid manure. Not one person in this neighbourhood has complained, to the best of my knowledge, of any unpleasant results from the watering of my land, while more than a dozen residents and visitors, to whom I have men-

tioned an objection of a similar kind to yours, put forward in the Scotch agricultural journal, have laughed at its absurdity. I have had the field in which my house stands, consisting of 36 acres, thoroughly watered; and never once have I, nor, to the best of my knowledge, has any one in my house, ever perceived the slightest smell from it. Again, I have had meadow-ground, immediately adjoining the residence of a neighbouring clergyman, more thoroughly watered than any other part of my land, and, he tells me that in his house the inmates have never perceived any ill odour; and I have often observed him and his family engaged in archery practice on parts of that meadow that had been watered within 24 hours, and within 150 yards of the spot that was being watered at the time, while they might easily select other ground for their pastime, if there were anything offensive in the irrigation. These are facts which it is difficult to reconcile with the "decidedly unpleasant smell over the whole district" which you speak of, but which I never perceived or heard of before.

"I maintain, and I think it a most important point, proved by my experiment, that town sewage may, if sufficiently diluted with water, and not allowed to stagnate or ferment, be distributed over both pasture and arable land without detriment to health, or annoyance to the senses, of any one; and that, in this respect, it is far preferable to the ordinary method of manuring by spreading dung in the usual solid form.

"Your second objection is on the question of the economy of the practice, and you institute a comparison between the expense of my works and those of Mr. Wicksteed, at Leicester—a comparison that will not bear a moment's examination.

"You suppose that his apparatus costs less per head of the population than mine; but I have shown that, on your own figures, his has cost 8s. 4d., and mine only 7s. 9d. But you must bear in mind this material difference, that that expense in my case covers every operation to the time the whole fertilising material from a given population, soluble and insoluble, are placed actually in the land, while at Leicester it only covers the operation of extracting a portion (less than a moiety) of the valuable ingredients from a part of the sewage of the given population, and leaving those ingredients mixed with a large quantity of carbonate of lime on the manufacturer's premises to be sold and carted away at a very considerable additional expense.

"But let me place the comparison in another light. Mr. Wicksteed offers his solid manure (formed by the precipitation, by means of lime, of the materials held in suspension in the sewage of Leicester) at 45s. a ton. Add to this the expense of carriage to the land, spreading, ploughing in (or deduct from the value the greater waste if it be not ploughed in), at 10s. a ton, and the farmer's profit from using it, at 5s. a ton; so that the value of the manure in the ground should be £3 a ton. Supposing it to be so, for the sake of argument: let me compare the result of my system on a similar basis of calculation.

"I distribute about 165,000 gallons of sewage a day; and I have ascertained by experiment that even in December each gallon yields about an ounce of solid manure precipitated by lime, similar to Mr. Wicksteed's; so that, leaving out of calculation the valueless carbonate of lime, I get 4 tons 12 cwt. of solid manure, of the value of £13 16s., placed in my land every day, in addition to the manure remaining in a liquid form, which the best authorities declare to be the greater portion; so that the £13 16s. may at least be doubled, giving £27 12s. a day to represent my "value received." This you will admit to be pretty good interest on the outlay of £3000, after allowing ample margin for working expenses.

"Of course, I do not mean for a moment to say that the profits are really anything of this kind; but such is the result of the comparison you have yourself originated between the two methods of utilising town sewerage; and any error in the result must lie in the basis of the calculation, viz., the value of the solid deposit when precipitated.

"In conclusion, let me say that the attention which I have given to this subject results in the conviction that the principle of extracting solid manure from sewage by precipitation, or by any other method hitherto suggested, is essentially erroneous. It involves a very large expenditure in performing the difficult operation of separating solid from liquid; it involves the loss of the most valuable portion of the manure; and it rejects the peculiar facilities for removal and distribution which the liquid condition of the sewage presents; and I believe that the distribution of the liquid itself may be profitably effected by gravitation, where the levels permit, and by steam power where they do not, if proper arrangements be made, and due economy of plan and construction be observed; that is, if "duly qualified engineers," of a speculative turn and temperaments, be not allowed to indulge their taste for grandeur of design, and finish of workmanship. G. H. WALKER."

Newbold Grange, Rugby, April 23, 1856.

This account, of Mr. Walker's own writing, contrasted with the account from him, of your correspondent's reporting, is characteristic of the style of speech as well as of writing of the latter, which is, to make a string of assertions or inuendos, the answers to which involve long explanations, or citations of proofs, on questions frequently irrelevant—occupying time and trespassing on patience, or which provoke curt denials, and lower the character of the Society's discussions. Mr. Mechi will deal with the assertions in respect to his works as he shall think fit.

In respect to the writer's statement that, "Rugby has been sewered and supplied with water, or, rather, not half supplied with water, under the plans of the Board of Health," it is to be observed that, if he knew enough of the case to entitle him to speak of it, he ought to be aware that, whatever the principles of the works may be, the plan of the works for the particular town was made by the consulting engineer, but is not yet executed so as to give the full supply contemplated; for, in fact, little more than one-tenth of the gathering ground proposed by him for the supply of the town, by means of permeable land drainage pipes, has yet been made available, on account of the refusal of the occupiers or the owners to allow to be taken, without exorbitant compensation that excess of water in the substratum, the removal of which would benefit their land to an extent to justify them in incurring the ordinary land drainage expenses for the purpose.

In respect to Mr. Smith of Deanston's plans, if your correspondent had a competent knowledge of them, he must be aware that Mr. Smith had originally prepared a plan of a gigantic wheel, of nearly two hundred feet in diameter, for raising the sewage of the metropolis at its outfall, and distributing it down an inclined plane, to be applied by the method of submersion, as at Edinburgh, and that his colleagues in the public service well know that in whatsoever he subsequently said or did, he acted not upon suggestions made *by* him, but upon instructions given *to* him.

Every writer, with any just pretensions to comment on my labours or the views of farmers in respect to them, ought to be aware that I have never asked them for mere faith in any "manure theories" of my own, but have carefully directed their attention to the practical operation of works, of the produce of which in growing crops they might see and judge for themselves, and easily make trial for themselves, and of the expenses of which works they might ascertain for themselves. If manures of greater fertilising power than the cheap town manures can be obtained more cheaply, or distributed more inoffensively, rapidly, and completely, and more economically than the one stated in the report of the trial work which I cited, namely, of 110 tons per acre delivered in little more than an hour, at a working expense of one shilling and eightpence, I shall be much rejoiced to see those plans in full practical application.

I am, &c.,
EDWIN CHADWICK.

Proceedings of Institutions.

Kandy (Ceylon).—The Agri-Horticultural Society held a General Meeting of its members the 31st of January last. E. Rawdon Power, Esq., in the Chair. The Committee, in presenting their report for the year just passed, congratulated the Society upon its prospects of usefulness and of progress. The shows which had taken place, though not of that striking character which it was hoped they would reach by-and-bye, had nevertheless been the means of directing the attention of residents, both native and others, to matters connected with the productive capabilities of the island, and also of bringing forward many indigenous productions, some of which would probably eventually prove of importance and value. Among the more interesting of the latter might be enumerated collections of woods, oils, gums, and fibres; and of these, the woods were especially well represented in the numerous specimens exhibited by Mr. Samuel Jayetilleke and by Mr. W. H. Wright. Samples of cotton, tobacco, vanilla, and various spices were also to be seen on the tables, and there was a fine show of English and native vegetables. The display of flowers, owing to the unfavourableness of the season, fell short of what might be expected under more favourable circumstances. In issuing the list of prizes for the next exhibition to take place in June, the Committee had been at some pains so to frame it as to direct the attention of cultivators to those productions especially which were likely to prove of most importance to the island; and it would be also seen in reference to this list, that exhibitors were expected to be provided with some quantity of the articles for which they are to look for prizes, as these prizes would not be given for the mere samples unless under particular circumstances, such as for a specimen of some new valuable production or for some other reason, which might be satisfactory to the committee. The committee, taking into consideration all matters bearing upon the subject, were not sanguine of a great deal being accomplished immediately, but they felt sure that by means of these shows much good was being gradually effected; and they earnestly hoped that the supporters of them would not relax in their efforts or allow their interest in them to subside. Upon application by the committee, the Society had been taken into union by the London Society of Arts, a circumstance of great importance to this Society, as they would now forward to England, with the certainty of due attention being given to them, any native productions which might be exhibited at the shows and might appear to the Society likely to become of value as articles of export, besides deriving other advantages from being connected with such a society in England. The committee were also putting themselves in communication with similar societies with their own in some of the other colonies and in India, and with a few of these societies they were already commencing a correspondence, which, it was to be hoped, would prove mutually advantageous. The committee had every reason to hope, judging from the anxiety and liberality ever evinced by his Excellency, Sir H. G. Ward, in the furtherance of all measures bearing upon the interests of Ceylon, that at no distant period the scope of action of this Society would, by a small grant from the public funds, be extended. The committee would incidentally allude to the beneficial results to this colony if cotton could be remuneratingly produced, and they considered that the intervention of Government would be a very essential element of success; they perceived that at the settlement of Moreton Bay, in the colony of New South Wales, where cotton cultivation was being tried, a premium had been offered by the local government. The Committee would instance the case of cocoa-nut oil, as illustrative of the beneficial results of the interference of Government, up to a certain point, in new articles of export. The local government of the day imported a steam-engine from England, manufactured the oil in Colombo, and consigned it to London, to the island agent, where it was sold, and the account sales, when received in Ceylon, were duly published in the Government *Gazette*, with a note that the steam-engine was for sale. A highly respectable firm purchased the engine, &c., and from that period commenced the export of cocoa-nut oil by private individuals, which had reached so high a figure at the present time. The committee would further give expression to their respectful hope that his Excellency would, as had been solicited, be pleased to request the active co-operation of the several Government agents with the Society in regard to the general subject of cotton; and that it might, perhaps, be thought advisable to encourage so valuable a product, by permitting and encouraging the inhabitants of districts favourable to its growth, (and there were thousands of acres well adapted for its cultivation), to pay, for a certain period, a portion of the tax due by them to Government in cotton, the rate at which it was to be received to be fairly adjusted, and the cotton so received to be sold in the colony, which might be done without difficulty, to any of the mercantile island firms. This procedure the committee understood was some years ago adopted in the case of plumbago, and, if sanctioned in the case of cotton, might be strictly limited to a period which would permit of the experiment, as to the character and value, and, if any impetus were given thereby, to the further cultivation of this valuable article being fairly tested. The committee considered it highly probable that the re-arrangement of the flora of the island by the superintendent of the Royal Botanic Gardens, which was in active progress, might, while it was a measure much required for the credit of the colony, lead to some valuable discoveries in which this Society might, perhaps, aid in regard to the properties of plants, &c., and be thus susceptible of being turned to valuable account. They submitted that the adoption of the "Cui bono" principle, both in respect to the degree of public aid in furtherance of such investigations, and to experiments carried out by this Society, might be carried too far, and effectually arrest both discovery and improvement. In conclusion, the committee had much pleasure in submitting an account of the receipts and expenditure of the past year, by which it would be observed that after the expenses of the last exhibition had been met, there was a balance of £45 3s. left in the hands of the honorary treasurer. While the committee looked with satisfaction upon this balance, they did not forget that it was largely owing to the liberality of exhibitors in returning to the Society their prize money. The greatly increased number of medal prizes, which it had been determined to offer for competition at the exhibition of this year, would be a serious addition to the expenses of the Society, but the committee confidently hoped that the number of subscribers, which last year amounted to 75, would reach a still higher number this year. The Society was unencumbered by any outstanding debts, with the exception of small sums to the local newspapers for advertisements, accounts of which have been applied for but not yet rendered.

MEETINGS FOR THE ENSUING WEEK.

TUES. Zoological, 9.
FRI. United Service Inst., 3. Colonel Chesney, "On the Political, Military, and Commercial Importance of the Euphrates Route to India."

PARLIAMENTARY REPORTS.

SESSIONAL PRINTED PAPERS.

PAR. NO.

Delivered on July 16th.

177. Persian Expedition—Estimate of the Extraordinary Expenditure.
National Education (Ireland)—22nd Report of the Commissioners, Vol. I.

Delivered on July 17th.

183. Navy—Supplementary Estimate.
118. Bills—Loan Societies.
119. ——— Sale of Corn, &c.
122. ——— Land and Assessed Taxes, &c. (Scotland) Acts Amendment.
123. ——— Valuation of Lands (Scotland) Act Amendment.
125. ——— Turnpike Acts Continuance.
126. ——— Sale of Obscene Books, &c. Prevention.

Delivered on July 18th and 20th.

163. Wareham Election—Minutes of Evidence.
181. Civil Contingencies—Account.
184. Tea and Sugar—Accounts.
171. New Zealand—Report from the Committee.
172. Land Transport Corps—Report from the Committee.

PATENT LAW AMENDMENT ACT.

APPLICATIONS FOR PATENTS AND PROTECTION ALLOWED.

[*From Gazette, July* 17.]

Dated 6th May, 1857.

1274. Johann Philippe Becker, 51, Rue Doudeauville, à la Chapelle St. Denis, Paris—Improvements in the mode of silvering animal, vegetable, and mineral objects.

Dated 21st May, 1857.

1438. John Wesley Hackworth, Darlington—Improvements in machinery or apparatus for forcing, lifting, and exhausting æriform bodies and liquids, applicable to blast furnaces.

Dated 27th May, 1857.

1494. James Savory, Tewkesbury, Gloucestershire—A machine for separating seeds, whitecoats, and dirt from wheat and seeds, awns, and dirt from barley, and for cleaning and polishing wheat, barley, and other grain fit for market.

Dated 2nd June, 1857.

1550. Charles Shaw, Birmingham—A new or improved manufacture of matts for photographic and other pictures.

Dated 12th June, 1857.

1645. Joseph Whitworth, Manchester—Improvements in ordnance, fire-arms, and projectiles, and in machinery employed in their manufacture.

Dated 17th June, 1857.

1693. Henry Hosch, 12, Old Jewry-chambers—An improved shirt-cutting machine. (A communication.)

Dated 20th June, 1857.

1722. William Wright, Sheffield—Improvement in flushing apparatuses applicable to cisterns and waterclosets.

Dated 22nd June, 1857.

1741. John Norris, junr., New York, and George Worstenholm, St. Louis, Missouri, U.S.—Improvements in machinery for making nails, bolts, spikes, screws, rivets, and screw blanks.

1743. Richard Murdoch, Baltimore, U.S.—Improved running gear for vehicles.

1745. Thomas Mackenzie, Rathbone-place, Oxford-street—Improvements in the internal decorations of those parts of buildings to which window draperies are to be affixed, and in the arrangement and construction of the curtain fixtures.

Dated 24th June, 1857.

1761. Robert Mallet, Bridge-street, Westminster—Improvements in tiles and coverings for roofs and other parts of buildings.

1763. Henry Genhart, Liege, Belgium—Improvements in fire-arms, in rifleing the same, and projectiles employed therewith.

1765. John Juckes, 8, Dame-street, Islington—Improvements in washing machinery.

1767. Jabez Church, Upper Kennington-lane, Vauxhall—Improvements in the manufacture of artificial fuel.

1769. George Henri Marc Muntz, Handsworth, Staffordshire—Improvements in the manufacture of metal tubes and axles or shafts.

1771. Ernest Auguste Bourry, St. Gall, Switzerland—Improvements in apparatus or machinery for working, expressing, and moulding clay and other plastic materials.

1773. John Henry Johnson, 47, Lincoln's-inn-fields—Improvements in the preparation of surfaces for receiving paintings or printed impressions thereon. (A communication.)

1775. Edouard Besnier de la Pontonerie, Paris—Improvements in apparatus for consuming smoke.

Dated 1st July, 1857.

1831. Joseph Nickless, Coalbrook-dale, Salop—A new or improved railway chair.

1833. Alexander Prince, 4, Trafalgar-square, Charing-cross—Improvements in the construction of irons used by tailors and others for pressing cloth and other materials. (A communication.)

1835. William Edward Newton, 66, Chancery-lane—Improved processes for ornamenting metallic surfaces, and for producing surfaces in intaglio or in relief for printing purposes. (A communication.)

Dated 2nd July, 1857.

1837. Frederic Ludwig Hahn Danchell, 452, New Oxford-street, and Henry Kimber, Grove-terrace, Clapham—Improvements in the manufacture of fire and waterproof bricks, plates, crucibles, and other vessels, forms for castings, and similar articles. (A communication.)

1839. Edouard Beckman Olofson, Cologne, Prussia—Improvements in the manufacture of pigments or colours for preserving iron.

1841. Marguerite Antoinette Laurent, 39, Rue de l'Echiquier, Paris—A new antiseptic composition.

1843. William McCraw, Edinburgh, N.B.—Improvements in the production of photographic pictures.

1845. Charles Orphin and Edward Lyons, Birmingham—Certain improvements in table and other lamps.

1847. George Cutler, Manchester—Improvements in mangles.

1849. William Rowan, Belfast—Improvements in scutching and heckling flax and other similar vegetable fibres, and in machinery employed therein.

1851. Charles W. Woodworth, Liverpool—Improvements applicable to capstans and other like purchases. (A communication.)

Dated 3rd July, 1857.

1853. Joseph Lockett, Strangeways, and William Watson, Alexandria, Dumbarton, N.B.—Improvements in machinery for engraving on tracing designs for cylindrical or other surfaces for printing calico and other materials.

1855. Alexander Angus Croll, Harold's Wood Lodge, Romford—Improvements in the treatment of liquors containing combinations of sulphur with ammonia.

1857. Emanuel Ruegg, 39, Rue de l'Echiquier, Paris—An improved calendar inkstand.

1859. Henry D. Mears and William Houlton, junr., Baltimore, U.S.—An improved seal for railway luggage vans, and for other purposes.

1861. William Thomas Hendry, 38, Upper Thames-street, and Robert Henry Hancock, 23, Great Percy-street, Pentonville—Improvements in the manufacture of flexible tubes or hose pipes.

1863. Thomas Royds, Thomas Roscow, and James Lord, Rochdale—Improvements in lifting heavy bodies under certain circumstances, such as minerals or other substances from mines to the surface of the earth, or from one story of an edifice to another, and in machinery or apparatus to be used for such purposes.

WEEKLY LIST OF PATENTS SEALED.

July 17*th.*

139. Charles Fréderic Vasserot.
142. Charles Fréderic Vasserot.
150. John Long.
160. Frederick Walton.
169. William Henry Barlow and Henry Woodhouse.
174. John Massey and James Hargreaves, jun.
179. Samuel Dyer.
188. François Alexandre Nicolas Delsarte and Elisée Valin.
215. John Whines.
222. William Stubbs and James Burrows.
235. James Stead Crosland.
262. Arthur Malins.
302. Brook Hodgson and John Carter.
316. Julian Bernard.
458. Charles Cowper.
493. William Oakes.
530. Charles Henry Murray.
840. Simon Martin Allaire.
1350. Robert Stirling Newall.

July 21*st.*

183. Thomas Harris.
189. James Warne.
197. Robert Johnstone.
198. William Roberts.
199. Henry William Wimshurst.
203. George Bedson.
204. Charles Fréderic Vasserot.
209. John Folliott Powell.
213. Thomas Ayles and Robert Andrews Ayles, junr.
214. Patrick Henry Sharkey.
216. James Harris.
227. William Littell Tizard.
229. Rd. Archibald Brooman.
239. George Leonard Doelling.
249. Walter Henderson Sisterson.
250. Rd. Archibald Brooman.
311. Richard Laming.
323. Samuel Hart.
373. John Harding.
391. William Wood Pilcher.
535. John Milnes and William Thompson.
597. Theodore Hyla Jennens.
685. Charles Colton Dennett.
1037. Joseph and Edmund Ratcliff.
1177. Joseph Belshaw.
1247. John Peter Booth.
1295. John Stenhouse.
1345. Stephen Yeldham.
1407. William Whitehead.
1413. John Hardley.

PATENTS ON WHICH THE STAMP DUTY OF £50 HAS BEEN PAID.

July 14*th.*

1554. Elijah Henry Brindley.
1558. Thomas Wright.
1571. John Livesey.

July 15*th.*

1569. John Lockhart.

July 16*th.*

1580. William Beckett Johnson.

July 17*th.*

1598. Thomas Chambers, junr.
1624. George Fergusson Wilson and George Payne.
1664. Robert Henry Thompson.

July 18*th.*

1591. Richard Roberts.

WEEKLY LIST OF DESIGNS FOR ARTICLES OF UTILITY REGISTERED.

No. in the Register.	Date of Registration.	Title.	Proprietors' Name.	Address.
4005	July 15.	The Waistcoat Shirt	Henry Woodrow	37, Granville-square, Clerkenwell.
4006	,, 16.	Improved Frame for a Chaff-cutting Machine	Francis Richmond and Henry Chandler	Salford.
4007	,, 17.	Horse Crib Biting-preventive Head Collar	Thomas Cook	4, Hay's Mews, Charles-street, Berkeley-street.
4008	,, 20.	Woman's Hosiery Vest	Thos. Ashwell and James Hobson Wallis	Nottingham.
4009	,, 22.	The Excelsior Pencil Sharpener, or General Coupe Crayon	Charles Rowley and Co.	Birmingham, London, and Manchester.

Journal of the Society of Arts.

FRIDAY, JULY 31, 1857.

ART TREASURES EXHIBITION.

The period fixed for the Society's visit to the Art Treasures Exhibition at Manchester, is the week commencing Monday next, the 3rd of August.

Arrangements have been made with the Great Northern Railway to take the members and their friends from London to Manchester and back, by any trains, *express* or otherwise, on and after the 1st of August, at a fare and a-half the double journey, viz., £2 12s. 6d., 1st class; £1 17s. 6d., 2nd class. The tickets to be available for seven days from the date of issue.

The Great Northern will also, if a sufficient number of members express their intention of going, run a special train on Monday, the 3rd of August, for their accommodation; but, to enable this to be done, the members should send in their names to the Secretary of the Society as early as possible.

The members are invited to a *Soirée* at the Royal Institution, Manchester, on Wednesday, the 5th of August. Ladies are invited.

Excursions will be arranged to visit some of the distant mills and manufactories.

It is proposed that the members and their friends should dine together on one day during the visit.

As in the case of the visit to Paris, persons duly proposed for membership will, though not actually elected, be admitted to all the privileges of the Manchester visit.

The Local Committee at Manchester have made the following arrangements:—

The Literary and Philosophical Society of Manchester have placed their rooms (George-street) at the disposal of the Society of Arts, where a reception room will be provided for the members, and proper officers will be in attendance to give information, and where communications may be addressed on and after the 27th July.

Permission has been granted for the members to visit the following warehouses, works, &c., during the week of the visit on showing their cards of membership:—

Warehouses.—S. Fletcher, Son, and Co., Manchester; J. and N. Philips and Co., Manchester; John Pender and Co., Manchester; Potters and Norris, Manchester; S. and J. Watts and Co., Manchester.

Iron Works, &c.—Edward T. Belhouse and Co., Manchester; Wm. Fairbairn and Sons, Manchester; P. Fairbairn and Co., Leeds; Joseph Lockett and Co., Strangeways Engraving Works, Manchester; Mather and Platt, Manchester; William Muir and Co., Britannia Works, Manchester; James Nasmyth and Co., Patricroft, Manchester; Parr, Curtis, and Co., Manchester; Peel, Williams, and Peel, Manchester; Platt (Brothers) and Co., Oldham; Sharp, Stewart, and Co., Manchester; Joseph Whitworth and Co., Manchester; Richmond and Chandler, Agricultural Implement Works, Manchester; James Walton and Co., Cardmakers, Denton.

Glass Works.—Percival, Yates, and Vickers, Manchester; Webb and Ellis, Manchester.

Mills and Manufactories.—Jas. Akroyd and Sons, (Worsteds, &c.), Halifax; Armitage and Ward, Manchester; Sir E. Armitage and Sons (Cotton), Manchester; Thomas Bazley (Cotton), near Bolton; Bradshaw and Hammond (Printworks), Levenshulme; Thomas Dickins and Co. (Spring Vale Dye Works), Middleton, near Manchester; Thomas Hoyle and Co., Mayfield Print Works, Manchester; Thomas Houldsworth and Co. (Cotton), Manchester; Kershaw, Leese, Sidebotham, and Co. (Cotton), Stockport; Marshall and Co. (Flax), Leeds; Oxford-road Twist Company (Cotton), Manchester; Samuel Radcliffe and Sons (Cotton), Rochdale; Titus Salt and Co. (Worsteds, &c.), Saltaire, Bradford; Seedley Printing Company, Manchester; P. Spencer (Alum Works), Pendleton; Richard Sykes, Bleach Works, Stockport.

Permission has also been received to visit the following Institutions:—

Royal Exchange (Reading Room). Portico (Library and News-room). Royal Infirmary. Ragged Industrial Reformatory Schools. Athenæum (Reading Room). Mechanics' Institution. Chetham's Library. Free Library. Peel-park Museum and Library. Manchester Corporation Water Works.

It is to be distinctly understood that the members have *not* permission to visit works where a manufacture is carried on of similar character to any in which they may be engaged or may be personally interested.

Members desiring any information respecting accommodation at hotels or lodgings, should apply to Mr. Haden, at the Offices of the Art Treasures Exhibition Committee, 100, Mosley-street, Manchester, with precise information as to the extent of accommodation, and the period for which it is required.

Members intending to join in this visit who have not already received their cards, may obtain them by application to the Secretary, at the reception rooms, Literary and Philosophical Society, Manchester. The Manchester Visit Committee will meet at the above rooms at 11 o'clock to-morrow (Saturday).

Members will have the privilege of introducing two friends, either ladies or gentlemen, to join the party, to whom cards will also be issued on the application of a member.

HONORARY LOCAL SECRETARIES.

The following gentlemen have been appointed Honorary Local Secretaries:—

Axon, William	for Chester.
Ainsworth, T. Crooke	,, Blackburn.
Barker, Dr. Herbert	,, Bedford.
Darlington, John	,, Bradford.
Felkin, William	,, Nottingham.
Holmes, Herbert M.	,, Derby.
Hume, Rev. Dr.	,, Liverpool.
Macready, W. C.	,, Sherborne, Dorset.
Newall, Henry	,, Rochdale.
Peel, George	,, Manchester.
Ratcliffe, C.	,, Wolverhampton.
Richardson, Dr. Thomas	,, Newcastle-upon-Tyne.
Ryland, Arthur	,, Birmingham.
Spiers, R. J.	,, Oxford.
Tartt, Wm. Macdowel	,, Cheltenham.
Wheatley-Balme, E. B.	,, Mirfield.

NOTICE TO INSTITUTIONS.

The Council having purchased from the Messrs. Longman a number of copies of the Society's Reports on Industrial Instruction, for the use of the Institutions in Union, the Secretary will be prepared to send copies, free of charge, to any of the Institutions applying to him for them.

DISTRIBUTION OF CERTIFICATES AND PRIZES (HUDDERSFIELD).

The Certificates and Prizes awarded by the Society's Examiners, at the examination held in Huddersfield during the first week in June, were distributed to the successful candidates on Wednesday evening the 29th inst., at the Riding School, Huddersfield. The Right Hon. the Earl Granville presided.

The Secretary read the following reports from the examiners:—

The Board of Examiners report, for the information of the Council, that the results of the recent Examinations held by the Society of Arts at Huddersfield for the members of the Mechanics' Institutions of the north of England in union with the Society, and for those pupils who had been instructed in affiliated schools, are highly satisfactory. For the details of the Examination they refer to the several reports of the Examiners in the different subjects and their subdivisions.

The Board of Examiners believe it to be their duty, whether as regards the future Examinations of the Society of Arts, or with reference to the interests of the young men themselves, to call public attention to those features which require amendment or alteration.

In the first place they would observe that while the answering in the special subjects was in many cases of a very high order, and displayed genius, industry, and research, yet the general style of answering in the preliminary papers, which were set with a view to test the handwriting and familiarity of all the candidates with correct spelling, the ordinary laws of English composition, and the common rules of arithmetic, was much below the standard which the Board of Examiners had agreed on. In these elementary subjects the average of the attainments of the candidates was below that of London. The Board of Examiners recommend that more attention be given to these "common things." On the acquirement of this simple elementary knowledge will often, in a great measure, depend whether the candidates ever shall have the opportunities afforded them of testing their industry and ability, as proved by their acquirements in higher branches of knowledge. In the eyes of an employer an acquaintance with algebra will not compensate for inaccuracy in common addition, nor will a profound knowledge of history much avail him who cannot spell.

They recommend that in future years the preliminary examination be made a stringent test of the attainments of the candidates in the rudiments of a common English education; that the examination of the preliminary papers do not take place during the progress of the examinations as at present, but that this duty be remitted to the Board of Examiners to discharge after the examination shall have been concluded, and that no credit be given to the special papers of any candidate who shall not, in his elementary examination, come up to a certain standard.

The experience acquired by the Board of Examiners, leads to the conviction that it would be desirable, wherever it may be possible, to define more strictly than has been done hitherto, the subjects of examination, and to recommend one or two cheap text-books, not more, that may easily be procured.

To give a wide choice of books is about equivalent to recommending none at all, for the means of the candidates will not admit of their purchasing a large number of books, and even if it were practicable, it would not be desirable, for a multiplicity of books tends rather to distract than concentrate the attention of the student. The candidates should not be left to grope their way without a guide, and to acquire by slow degrees, towards the end of their reading, that information with which they ought to have been furnished at the beginning. The Board, therefore, are of opinion that in all the subjects a definite line of examination ought to be laid down, to enable candidates to direct their reading in such a way as to lead them to concentrate their application, instead of being, as it is too often at present, loose, vague, and desultory.

The experience of the Board of Examiners leads them strongly to recommend that the local centres of examination next year, be not multiplied beyond those which may severally be taken charge of and personally superintended by at least one member of the Board. They believe that the Mechanics' Institutions, the commercial schools, and the public generally, will be better satisfied by the Society of Arts publicly and explicitly assuming the entire responsibility of these examinations.

The Board of Examiners strongly recommend to the Council that the subjects to be examined in next year—with as little alteration from the present scheme as possible—the Time-tables, with the selected "Centres of Examination," be made known to the public not later than the end of September, so that the Mechanics' Institutions, the commercial schools, and the other bodies connected with the Society, may have ample time to organize their classes for the Society's Examinations to be held throughout the country during Whitsun-week, commencing the 24th of May, 1858.

MATHEMATICS.

The Examiners in Mathematics at Huddersfield report as follows:—

"The subjects examined, the number of candidates in each, and the certificates awarded, will be found in the general tabular statement.

"While the results of the recent Examinations at Huddersfield are in many respects eminently satisfactory, it is, at the same time, proper to call attention to existing defects. Several of the candidates, in their haste to take up advanced subjects, have failed or neglected to master those elementary principles on which all real progress must be based. To fail in algebra and to answer well in trigonometry is inverting the natural order of sound mathematical attainment; a real knowledge of first principles is of far more value than a ready familiarity with the working of mere mechanical rules, as applied to the solution of the questions proposed.

"The Examiners have also remarked a general slowness and needless minuteness in working out their questions. Some candidates carried this so far as to copy out at length the printed questions themselves, instead of referring to them by their proper numerals. Others went through every step of the proofs with the most laborious precision. Thus several of the candidates, who did very well so far as they went, wasted the short time at their disposal. The Examiners would prefer the salient points, and the chief steps of the solution, to be given with neatness and brevity. To pick out the leading features of a proof indicates a much higher mastery of the question than is shown in setting out the entire demonstration. On this ground the Examiners believe, judging from the specimens of the work done, that, could more time have been given, the results would have been still more striking. The Examiners have been sparing in the award of first and second-class certificates. The rules previously laid down did not admit of a larger issue. It should be borne in mind that the certificates hold a higher grade than the prizes, and it is right that they should be so considered by the public. The certificates embody the formal decisions of the Board of Examiners on the respective merits of the several candidates, and this decision is confirmed by the authoritative sanction of the Society of Arts in its corporate capacity; while, whether prizes shall in addition be awarded must, in a great measure, depend on the contingent liberality of private persons from year to year.

"In arithmetic, the Examiners will be prepared to attach considerable importance to a ready familiarity with the properties of decimals, especially in their application to the monetary and other common business transactions of commercial life.

"JAMES BOOTH.
"CHARLES BROOKE.
"JAMES GLAISHER."

BOOK-KEEPING.

The Examiner in Book-keeping reports thus:—

"I consider that for the most part the papers sent in exhibited a want of application to the subject matter of examination, especially with regard to that portion of it which comprised the working out in a practical form of the supposititious transactions. In one instance only was this fairly done; in the majority it was scarcely done at all. But there were two or three instances in which the answers to all the other questions showed a praise-worthy and laborious pains-taking. On the whole I think these papers not satisfactory, and I have no objection to say that I consider the assignment of marks was governed by a liberal judgment with a view to avoid discouragement to the candidates; they are, on the average, decidedly inferior to the London Examination Papers.

"J. BALL."

PHYSICS.

The Rev. A. B. POWER, one of the Examiners in Physics, says:—

"In communicating to you, for the information of the Council, the result of my experience of the late examination held at Huddersfield under the auspices of the Society of Arts, commencing June 1, and continued during the four following days, my observations will be directed to two principal heads; first, as regards the general character and effect of the Examination, and, secondly, as relates to the department of Mechanics and Physics, in the conduct of which I have been associated with Mr. Brooke and Professor Goodeve.

"I have great satisfaction in stating my conviction, that the general result of the Examination held at Huddersfield will be found to equal the most sanguine anticipation formed of it; in estimating the value of the work accomplished on this occasion, and in judging of the merits of the papers, it must be remembered that this was the first attempt in the locality of the Northern Institutions; and to form a correct comparative estimate, reference should be made to the first Examination held in London, rather than to that of the present year. It will be found, no doubt, that many of the faults noticed last year in London have re-appeared at Huddersfield; but the same experience which has, to a great extent, corrected them in the first case will, in due course, remove them in the second. With this view, it will be desirable to have the directions and suggestions of the Examiners circulated among the Institutions at the earliest possible period before the formation of classes for the ensuing season. It was very obvious that many of the late candidates at Huddersfield were totally unaccustomed to the work of examination; they appeared to have but little idea of the method of using the limited time allowed for the papers to the best advantage, and the style of work, as regards writing and arrangement, was, in many cases, defective. It will be well to point out to the managers of Institutions the importance of some drill in this description of examination work, as several candidates might have taken a higher grade if these points had been understood. The general spirit which pervaded the Examination Rooms, and the feeling shown by the candidates were highly encouraging. It cannot be doubted, but that true earnestness of purpose animated the great majority, and that many will be found taking part in the struggle of future years, in the hope of higher success.

I endeavoured to carry out the programme of the examination in every particular. I am not aware of any single omission. I held *vivâ voce* examinations in every subject marked for such exercise; the results of these examinations, according to my estimates, I have forwarded for the information of my colleagues, and I hope that my awards will be in harmony with the character of the written papers.

"With regard to the special divisions of Mechanics and Physics, as the awards determined by the joint estimate of the examiners are already in your hands, I need only remark, that the papers will bear comparison with those worked in London last year, and that with further exercise in the details of examinations, the candidates may be expected to acquit themselves very well. It appears that greater attention is generally given in the north of England to pure than to applied mathematics; I believe Dr. Booth's experience will corroborate this statement. I found some of the candidates very well prepared to answer *vivâ voce* questions on trigonometry and conic sections, particularly the former; but I observed, when I attempted to connect these subjects with physics the candidates were not generally able to follow me. The physics papers plainly show that the candidates have not been accustomed to deal with experimental evidence, and I could not but see in this an indication of a want in the lecture arrangements of the majority of Institutions. If definite courses of lectures on experimental physics could be provided, with the aid of supplementary class teaching, a great improvement might be effected in this department, and advantage would accrue in many ways, which the object of this report will not permit me to speak of more at large; it will not be out of place, however, for me to commend this suggestion to the notice of the Institutions in Union. It is a matter well worth the consideration, too, of the proprietors and managers of the large and important works distributed throughout the Northern counties.

"I think it desirable further to add, that I have formed a strong conviction of the inexpediency of multiplying centres of examination beyond the limit that can be managed by the personal attention of the Board; in other words, that wherever an examination is held, there ought to be at least one member present who would be responsible for its proper management in all respects. This opinion is founded upon my general knowledge and experience of examination work, and the effect of irresponsible agency in such matters, rather than upon any observations at Huddersfield; for it is only just for me to say, that I was, at my late visit, most efficiently supported by the able secretary of the Institution, who was indefatigable in his attention to every requirement, and that I was also greatly aided by many members of the committee, to whom I feel that my warmest thanks are due. I would only further add, that it will be well to have not only the subjects, but the time, places, and order of the ensuing Examination published as soon as possible. The arrangement of the subjects I consider should be the same for all places; and I would suggest a few alterations in matters of detail, to which it would be scarcely expedient to allude in this report.

"A. BATH POWER."

CHEMISTRY.

The Examiners in Chemistry report thus:—

"I find that the Huddersfield papers on Chemistry, though slightly inferior to those given in by the London competitors, are, with two exceptions, highly creditable to their authors.

"J. STENHOUSE."

Professor Solly adds:—

"I have not reported respecting the results of the Huddersfield Examination, because I had agreed with Dr. Stenhouse that he alone should report; lest, however, he may not have done so, I write to say that the chemi-

cal replies were, on the whole, satisfactory; they were certainly not so good as the replies given by the London candidates, which were remarkably good; but they were good and creditable replies. Probably the two sets of candidates were of different ages and circumstances; the latter were more like the replies of teachers, whilst the former appeared to be the replies of well-taught pupils.
"E. SOLLY."

Animal Physiology.

The Examiner reports that only one candidate presented himself at this examination and returned answers to six of the questions; that these answers are all more or less defective, and evince only the most superficial knowledge of the subject, but as they are free from positive errors, the Examiner has awarded to them, collectively, ten per cent. of the marks assigned to the paper.
W. SHARPEY.

English Literature.

The Examiners in English Literature and English History, have to report to the Society of Arts that they have awarded first-class certificates to Candidates (299), (220), (288), (330), and second-class certificates to candidates (209), (246), in English Literature. First-class certificates to Candidates (227), (262), (215), (220), (259), (264), (267), (272), (288), (289), (257), (276), and second-class Certificates to candidates (274), (246), (208), (311), in English History. They recommend for a prize in English Literature, (299), and in English History, (227). They wish further to state that the results of the examinations in both subjects have been highly satisfactory, and much exceeded their expectations.

The papers sent in by candidates in both subjects were deserving of unqualified approbation; they displayed, not only great care and accuracy, but an amount of thoughtfulness the examiners were not prepared to anticipate. Indeed, the answers of those candidates whom the examiners have recommended for prizes and certificates of the highest class, especially in English History, have not, in their experience, been surpassed by any class of candidates in similar subjects.

The Examiners would be very happy, if such were the condition of examinations generally, to submit these papers to any gentlemen who might wish to peruse them; observing at the same time that only a very limited period of three hours was allowed for answering the questions in English Literature, and two papers containing questions in English History.

The difficulty of these questions may be tested by the printed papers.

The Examiners have already had to return to the Society a very favourable report of the improvement at the London Examinations, and they consider those of Huddersfield in no degree inferior.

JOHN BREWER.
F. TEMPLE.
T. DUFFUS HARDY.

French.

The Examiner in French reports:—

"I herewith return you the Huddersfield French papers I have examined, and am happy to be able to report favourably of not less than ten candidates out of the seventeen. I beg to recommend Nos. 312, 227, 266, and 235 for a certificate of excellence, Nos. 322, 255, and 236, for a certificate of proficiency, and for a certificate of competency, Nos. 282, 238 and 295. With such a result, I think we have reason to be very satisfied, when we recollect what very little encouragement has been given, up to the present time, to a proper and efficient study of the modern classical languages, and when we bear in mind the many difficulties which stand in the way of the great mass of our young men, for the acquirement of a foreign dialect, even when that dialect is no other than the French. It is quite gratifying to trace in the papers of Nos. 266, 235 and 255, the same conscientious and persevering application which they first evinced in their oral examination as reported by M. Brocard, who kindly conducted the oral examinations at Huddersfield, in my unavoidable absence. I have also noticed with pleasure throughout most of those papers from young men evidently self-taught, the total absence in their answering grammatical questions, of that abstract and subtle phraseology with which it is too often the lot of pupils, under a more regular training, to have their memory burthened to the detriment of their better faculties. In short, the quality of the French papers (decidedly superior to those of the London candidates,) is upon the whole, and of course relatively speaking, very good and very promising.
"A. MARIETTE."

German.

The Examiner in German, says:—

"The paper of 267 is as creditable as any I have received from the London candidates, and the work of 243, 231 and 238, very promising."
"A. BERNAYS."

Geography, Descriptive and Physical.

The Examiners in Geopraphy report that the answering of the Huddersfield candidates was, upon the whole, satisfactory. At the same time, they feel bound to observe that the answering of some of the candidates was very unequal; that is, mistakes were made in simple things, while difficult questions were answered elaborately, and a very considerable amount of reading and research displayed in their treatment. They would also call attention to the fact that few, if any, of the candidates, either in London or Huddersfield, could draw from mere memory, without the aid either of map or book, an accurate map on a large scale, with the mountains, rivers, chief divisions and principal towns filled in with precision as regards latitude, longitude, and elevation. But, unless a candidate can do this for a large majority of the countries on the earth's surface, he cannot be said to have attained to proficiency, much less to excellency, in his knowledge of descriptive geography. The attention of the managers of mechanics' institutions and commercial schools ought to be drawn to this omission.

In physical geography the answering was very good, several of the candidates having received credit for the greater part of the questions. It may, however, be worthy of consideration, whether geology should not be separated from physical geography, and made a separate subject of examination.

J. BOOTH,
W. HUGHES.

Mr. W. Hughes, who conducted the oral examination of the candidates in geography, at Huddersfield, thus reports:—"Fifteen candidates presented themselves for the examination in descriptive, and sixteen in physical geography. I was, upon the whole, well satisfied with their answers to the *vivâ voce* questions which I put, and I consider several of the number entitled to a full proportion of the total number of marks which it is agreed to award to high attainments in the oral portion of the examinations. I may observe that I found a warm interest excited in Huddersfield by the Society's proceedings, and am confident that a knowledge of the results of the examinations is awaited there with anxious expectation."
"W. HUGHES."

Latin and Roman History.

The Examiners in Latin and Roman History recommend that the candidates be placed in the order set down in the schedule.

The standard of attainment, indicated by these certificates, is not a high one, but the papers of several of the candidates are creditable for (apparently) self-taught men, and only wanted greater accuracy to obtain a higher number of marks.

R. W. BROWNE.
FRANCIS R. SANDFORD.

Lord Granville then addressed the Meeting, after which, the Rev. Dr. Booth, Chairman of the Board of Examiners, introduced the successful Candidates to his Lordship, who presented them with their respective Prizes and Certificates as below.

PRIZES.*

Bower, James	Darlington Mechanics' Institution.
Broadbent, Allan	Huddersfield Mechanics' Institution.
Charleton, John	Newcastle Church of England Institute.†
Coleman, Joseph James	Halifax Mechanics' Institution.
Connon, William	Ings-house Academy, Wakefield.
Harrison, William	Bradford Mechanics' Institution.
Heslop, Henry Penn	Ripon Mechanics' Institution.
Hield, Sam	Leeds Mechanics' Institution.†
Hirst, James Binns	Huddersfield Mechanics' Institution.
Hough, Joseph	Leeds Mechanics' Institution.†
Leake, Joseph	Huddersfield Mechanics' Institution.†
Lister, Alfred	Leeds Mechanics' Institution.
Long, J. P. Atkins	Ings-house Academy, Wakefield.
Naylor, John, jun	Halifax Mechanics' Institution.
Scarborough, Thomas Smith	Halifax Mechanics' Institution.
Schofield, Abraham	Wakefield Mechanics' Institution.

For Drawing.

Booth, Amos	Huddersfield Mechanics' Institution.‡

CERTIFICATES.§

Arithmetic, 33 Candidates.

Alverthorpe Hall School:—Michael Shillito (P).
Darlington Mechanics' Institution:—James Bower (P).
Dewsbury Mechanics' Institution:—Daniel O'Leary (C).
Haley Hill Working Man's College:—Isaac Bairstow (C), Richard Cockroft (P), Barzillai Greenwood (C), Michael Broadbent (C), James Spencer (C).
Holmfirth Mechanics' Institution:—Matthew Haigh (P).
Huddersfield Mechanics' Institution:—Alfred Mills Blackburn (C), Thomas Broadbent (P), Charles Glendinning (P), James Hartley (C), Joseph Leake (P).
Ings House Academy:—William Connon (E).
Leeds Mechanics' Institution:—Charles Thomas Barnes (C), Sam Hield (E), Joseph Hough (P), Alfred Pickard (C).
Making-place Hall School:—Roberts Bottomley (C), Adam Clarke Cottam (P), Joe Crowther (C), Walter Whitehead (C).
Mossley Mechanics' Institution, (Y.U.):—John Pogson (C).
Wakefield Mechanics' Institution:—Joseph Albert Dear (P), Abraham Schofield (E).

Bookkeeping, 18 Candidates.

Halifax Mechanics' Institution:—John Leach (P).
Huddersfield Mechanics' Institution:—Charles Glendinning (P).
Leeds Mechanics' Institution:—Sam Hield (P).
Making-place Hall School:—John Sagar Veevers (C).
Wakefield Mechanics' Institution:—Abraham Schofield (C).

Algebra, 28 Candidates.

Alverthorpe Hall School:—Michael Shillito (P).
Darlington Mechanics' Institution:—James Bower (C).
Dewsbury Mechanics' Institution:—Daniel O'Leary C).
Haley Hill Working Man's College;—Isaac Bairstow (P), William Birkbeck (C), Barzillai Greenwood (C).
Huddersfield Mechanics' Institution:—Thomas Broadbent (C).
Ings House Academy:—William Connon (P).
Leeds Mechanics' Institution:—Sam Hield (C), Joseph Hough (E), Alfred Pickard (P).
Making-place Hall School:—Joe Crowther (P), Thomas John Denton (C), George Edward Gee (C), Edward Herring (C), George Lord (P).
Wakefield Mechanics' Institution:—Joseph Albert Dear (C), Abraham Schofield (C).
York Mechanics' Institution:—Henry Irwin Jenkinson (C).

Geometry, 24 Candidates.

Alverthorpe Hall School:—Michael Shillito (P).
Darlington Mechanics' Institution:—James Bower (C).
Dewsbury Mechanics' Institution:—Daniel O'Leary (P).
Eccleshill Mechanics' Institution:—Benjamin Baxter (C), Joseph Jowett (C).
Haley Hill Working Man's College:—James Spencer (C).
Holmfirth Mechanics' Institution:—Matthew Haigh (P).
Huddersfield Mechanics' Institution:—Thomas Broadbent (P).
Ings House Academy:—William Connon (P), J. P. Atkins Long (E).
Leeds Mechanics' Institution:—Sam Hield (P), Joseph Hough (E), Alfred Pickard (C).
Making-place Hall School:—George Edward Gee (C), Edward Herring (C), Robert Hutchinson (C), George Lord (P).
Mossley Mechanics' Institution (Y.U.):—John Pogson (C).
Wakefield Mechanics' Institution:—Abraham Schofield (C).
York Mechanics' Institution:—Henry Irwin Jenkinson (P).

Mensuration, 19 Candidates.

Black Dike Mills Literary Institution:—William Dockray (C).
Darlington Mechanics' Institution:—James Bower (C).
Dewsbury Mechanics' Institution:—Daniel O'Leary (C).
Huddersfield Mechanics' Institution:—Alfred Milnes Blackburn (P), Thomas Broadbent (C), Joseph Leake (E), William Lockwood (C).
Ings House Academy:—William Connon (C), J. P. Atkins Long (P).
Leeds Mechanics' Institution:—Sam Hield (C).
Wakefield Mechanics' Institution:—Abraham Schofield (E).
York Mechanics' Institution:—Henry Irwin Jenkinson (E).

Trigonometry, 12 Candidates.

Huddersfield Mechanics' Institution:—Thomas Broadbent (P).
Ings-house Academy:—William Connon (E), J. P. Atkins Long (E).
Leeds Mechanics' Institution:—Sam Hield (C), Joseph Hough (E), Alfred Pickard (P).
Making Place Hall School:—George Lord (P).

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* Each Prize consisted of a set of books, of the value of £4, to which, in certain special cases, a money prize was added.

† Money Prize of £5 5s. added.

‡ Money Prize of £5 5s., and "Fergusson's Hand-book of Architecture."

§ In this list (E) after a name signifies a Certificate of Excellence, (P) of Proficiency, (C) of Competency.

Mossley Mechanics' Institution, (Y.U.) :—John Pogson (P).

Wakefield Mechanics' Institution :—Abraham Schofield (P).

York Mechanics' Institution :—Henry Irwin Jenkinson (P).

Conic Sections, 5 Candidates.

Alverthorpe-hall School :—Michael Shillito (P).

Leeds Mechanics' Institution :—Joseph Hough (C).

Nautical Astronomy, 3 Candidates.

Leeds Mechanics' Institution :—Joseph Hough (C).

Statics and Dynamics, 7 Candidates.

Ings-house Academy :—J. P. Atkins Long (C).

Leeds Mechanics' Institution :—Joseph Hough (C), Alfred Lister (P), Edmund Outram (C).

Practical Mechanics, 6 Candidates.

Huddersfield Mechanics' Institution :—Thomas Broadbent (C).

Leeds Mechanics' Institution :—Edmund Outram (P), Joseph Hough (P).

Hydrostatics and Pneumatics, 4 Candidates.

Ings House Academy :—J. P. Atkins Long (P).

Leeds Mechanics' Institution:—Alfred Lister (P), Edmund Outram (C).

Northallerton Mechanics' Institution :—John Stamford Walton (P).

Electricity, 3 Candidates.

No Certificates awarded.

Heat, 4 Candidates.

Ings House Academy :—J. P. Atkins Long (P).

Leeds Mechanics' Institution,—Alfred Lister (P), Edmund Outram (P).

Northallerton Mechanics' Institution :—John Stamford Walton (C).

Chemistry, 7 Candidates.

Halifax Mechanics' Institution :—Joseph James Coleman (E).

Making-place Hall School:—George Edward Gee (P), Edward Herring (P).

Northallerton Mechanics' Institution :—John Stamford Walton (P).

Wakefield Mechanics' Institution :—Samuel Brewer Brooks (P).

Physiology, 1 Candidate.

No Certificate awarded.

Botany.

No Candidates.

Agriculture.

No Candidates.

Political and Social Economy, 1 Candidate.

Wakefield Mechanics' Institution :—James Edward Blakeney (C).

English History, 17 Candidates.

Bradford Mechanics' Institution :—William Harrison (E), William Jaques (E), Benjamin Raby (C).

Halifax Mechanics' Institution : —Joseph Greenwood (E).

Huddersfield Mechanics' Institution :—Alfred Milnes Blackburn (E), Allan Broadbent (E), Allen Earnshaw (P), John William Haigh (E), Joseph Leake (E.)

Leeds Mechanics' Institution :—Charles Thomas Barnes (P), Sam Hield (E), William Knapton (C), Alfred Lister (E).

Mossley Mechanics' Institution :—Joseph Howard (E).

Newcastle Church of England Institute :—John Charleton (E), Richard William Henzell (E).

Sheffield People's College :—Edmund Hutchinson (P).

Geography, 15 Candidates.

Bradford Mechanics' Institution :—Benjamin Raby (P), George Peacock (P).

Darlington Mechanics' Institution :—James Bower (E).

Eccleshill Mechanics' Institution :—Benjamin Baxter (C).

Huddersfield Mechanics' Institution :—John Berry (P), Charles Glendinning (C), William Hilton (C), James Binns Hirst (E), Thomas Walker (E).

Liverpool Collegiate Institution :—Thomas Eccleston Gibb (C).

Leeds Mechanics' Institution :—Alfred Lister (E), Edmund Outram (P).

Northallerton Mechanics' Institution :—John Stamford Walton (P).

English Literature, 9 Candidates.

Huddersfield Mechanics' Institution :—Thomas Barrett (P), Allan Broadbent (E), Allen Earnshaw (P), Joseph Leake (E), James Brignall Walton (C).

Halifax Mechanics' Institution :—John Naylor, jun., (E).

Making-place Hall School :—John Sagar Veevers (E).

Roman History and Latin, 7 Candidates.

Bradford Mechanics' Institution :—William Wilcock (C).

Ing's House Academy :—William Connon (P).

Leeds Mechanics' Institution :—Alfred Pickard (C).

Liverpool Collegiate Institution :—Thomas Eccleston Gibb (C).

Sheffield People's College, Edmund Hutchinson (E).

French, 17 Candidates.

Huddersfield Mechanics' Institution :—William Kilner (C), Richard Thomas Marsden (C).

Halifax Mechanics' Institution :—Thomas Smith Scarborough (E).

Newcastle Church of England Institute :—John Charleton (E).

Oldham Lyceum :—Thomas Crellin (E), William Steeple (P).

Ripon Mechanics' Institution :—Henry Penn Heslop (E).

Sheffield People's College :—John Cuttell (C).

Wakefield Mechanics' Institution :—Matthias William Crossley (P), Arthur Goldthorp (P).

German, 8 Candidates.

Halifax Mechanics' Institution :—John Cordingley (P).

Huddersfield Mechanics' Institution :—Samuel Donkersley (E), John William Haigh (P).

Leeds Mechanics' Institution : — James Denton (P), Sam Hield (E), William Knapton (P).

Sheffield People's College :—John Cuttell (C).

Drawing.*

Huddersfield Mechanics' Institution :—Amos Booth (E).

NATURE PRINTING.

The King of Prussia has presented Mr. Henry Bradbury with a large gold medal, for the work entitled "The Ferns of Great Britain and Ireland," illustrated by his process of nature printing.

Home Correspondence.

UTILISATION AND TRANSPORT OF FÆCAL MATTER.

Sir,—There is a very pretty quarrel between Mr. Chadwick and Mr. Sidney on the subject of the "Application of Sewage Water to Cereal Crops." The positive and negative are both in the superlative.

Of the value of human excreta there seems to be no dispute. The average individual produces about 10lbs. of ammonia per annum, equivalent to two bushels of wheat, value, say 12s. This I gather from the paper of Mr. Lawes, the philosophic practitioner. But this is with the ammonia on the land. The cost of getting it there is so much subtracted from its intrinsic value.

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* Returns not complete.

Mr. Chadwick insists that the cheapest mode of transit is to mix the excreta with many times their bulk of water—dilute them to an excess which, "Mr. Campbell's bailiff at Rugby says, makes them too weak, except in very dry weather, to be of any value."

"The sewage liquid manure is so weak they only use it to wash in guano or soot. They tried it with roots the first year and made a complete failure. They never dreamed of applying it to wheat—knew better." Still, however weak, if the whole of the excreta were in it, at the end of the year 10lbs. per head of ammonia must have been deposited—good cereal manure.

Now it would be very unfair to deny to Mr. Chadwick very considerable merit for his constant agitation of this sewage question. There can be no doubt that he has been very instrumental in his Board of Health capacity in drawing public attention to it, and he has pointed out very clearly the importance of making drains and sewers as non-porous as the pans of water-closets. But his merit seems to end in his becoming the partisan of a vicious system of pipe drain pedantry, arising from a want of comprehensive reasoning on his datum fact—the water closet,—of which his pipe drainage is but the enlargement—an elongated water closet—just as the old sewers and drains were by him designated "elongated cesspools."

The water closet is exceedingly cleanly and neat as regards the individual house of the wealthy man on the eminence. Mr. Chadwick will say this is far better than the saturation of soil around porous cesspools beneath or around the house. Quite true; but the Stygian river must crop out somewhere, and so in the case of London it finds it way into the Thames. It is said that only one-fifth of the London houses are water-closeted. What the results of this has been in the river we can appreciate, and what the result of the other four-fifths would be, we may imagine.

So far, Mr. Chadwick's system of pipe drainage—supposing it perfectly free from scrubbing brushes, and grease, and broken joints, and cracked pipes, and other difficulties,—so far it must end in a congregated monster nuisance, like the Kiln burn at the head of the Serpentine in former times. Mr. Chadwick had to provide for this, and consulted Mr. James Smith of Deanston, who told him of the marvels wrought by flooding the descending grassy slopes near Edinburgh with the "Foul burn." An experiment had to be made, and Manchester was selected, a town then purely of "middens"—fœcal matter deposited on ashes in shallow cesspools. A barge was fitted with an engine and pump, and another barge was filled partly with the contents of the middens, and towed along the canal to the farming districts. There the fœcal matter was made liquid with the canal water and ready to be pumped through hose on to the farmers' fields. But the liquefiers and the farmers could not understand each other till a local agent undertook the operation, and by the liquid emollient of "Yeale," administered at evening meetings, accomplished the feat.

In this case the cost of transporting water for liquefying was avoided, and the transport of the fœcal matter was arranged in a very cheap mode. It would be well to know if the practice is continued, and, "if not, why not?"

There can be no doubt that soil can be better saturated with chemical ingredients or manure in a liquid than without a liquid, and Mr. Chadwick has rightly insisted on this. But it is also probable that it is not desirable to exhibit liquid manure to every variety of growing crops. Mr. Chadwick draws a distinction between submersion and infiltration, asserting that the former was the process of James Smith, of Deanston—who, however, is not alive to testify, though Southwood Smith is—and the latter is his (Mr. Chadwick's) process. The difference is not very great; in one case the liquid is run upon the land, in the other it is made to fall in artificial rain, —both external applications. The better plan would probably be to inject the land below the surface, and not necessarily with liquid. It is quite probable that the chemical ingredients may, many of them, be ultimately applied in the gaseous form, and what the results would be of the destructive distillation of a ton of coal for the purpose of depositing the gaseous products, heat inclusive, under the soil for manure, we have yet to learn.

Mr. Chadwick's agricultural propositions grew, very naturally, out of his exclusive belief in water cleansing, and as his foul water increased in quantity it was needful to provide a receptacle for it. "The soil, the land, is the proper receptacle," said James Smith, of Deanston. "I have used the excreta of my cotton mills at Doune for years past. On the neighbouring land, the day's product was carried forth in a moveable receptacle at the day's end." But James Smith did not dilute it a thousand fold with the water of the Feith for the purpose of facilitating carriage. He was too wise for that. Mr. Chadwick, on the contrary, thinks the more water the better, and as the whole of London gets to be closeted, the result will be that the whole of the Thames water will have to be pumped up above bridge, to be filtered through farms innumerable, and discharged again below bridge. Now, it is quite right that all the London excretæ should be deposited in the soil where vegetables grow, but *non constat* that Mr. Chadwick's method of transport is the cheapest or the best, and moreover it is not even practicable in large towns without rivers. In round numbers, the fresh fæces of all the population of London is 150 tons per diem, and the urine is 1,500 tons. As manure, the greatest value is in the urine and not in the fæces. But the fæces are the main source of the pollution of sewage water, and if the fæces and urine could be kept wholly out of the sewers, all other matter, less the refuse of gas and other chemical works, might be permitted to run into the river without scathe.

It is, therefore, to chemistry, in neutralising, and not to the mechanical action of water in transporting, that we must look forward for a remedy. If the fæces be kept dry, and free from liquid, other than antiseptic material, they will not putrify; and, by dint of convenient receptacles, may be carted away without nuisance, either for manure or for consumption in the gas retorts. The urine, in which the great manurial value consists, can be easily transported, either by pipes or in barrels, and be diluted on the farms at a cheaper rate than in London. It is not the question of liquid manure that is at issue, but the question whether it is advisable to make putrid a thousand gallons of water in London, for the sake of transporting a pound of fæces to Tiptree or elsewhere. If every city were situated on a hill, with an ample water supply, and surrounded with grass land, it might be possible to irrigate with less evil than is said to exist in Edinburgh; but, for the removal of solid material, I apprehend fire will prove a more useful agent than water, and possibly coal smoke underground may prove as beneficial to vegetation as coal-smoke in the air is mischievous.

Mr. Chadwick, in his last letter, gives, by his peculiar phraseology, the impression that Mr. Sidney and others are actuated by the desire to "promote professional and trading interests;" this is scarcely logic. All men are actuated by some interest or other, and surely the salary of Mr. Chadwick, at the Board of Health, was as strong a professional interest as that of Mr. Wicksted at Leicester. Mr. Chadwick had to maintain his *status* by exhibiting work done and performed—paid labour, and not mere labour of love, and his results are as open to the challenge of interested inaccuracy as those of any other individual. A general will work very hard sometimes, to prove that, notwithstanding his ill-success, he and his officers and troops are perfect and faultless, lest "Othello's occupation be gone." The occupiers of public positions are subject to the same defects as those who occupy private ones; and government occupation does not necessarily convert a mere human being into an angel of light, speckless and flawless. Let us, therefore, deal in facts and speculations, and eschew imputations, sinking the individual in the office, though allowing everyone to claim his own specific share of a general operation, without supposing that the nominal head does everything, or that James Smith of Deanston did nothing but propose a wheel 200 feet in diameter. He also was an agitator, certainly not second in value to Mr. Chadwick.

I am, &c.,

W. BRIDGES ADAMS.

1, Adam-street, Adelphi, July 25, 1857.

DECIMAL QUESTION.

Sir,—In the report of the meeting of the Society of Arts, held on the 24th inst., contained in the last number of the Society's *Journal*, Mr. Miller applies to a portion of my evidence before the Decimal Coinage Commission, the terms "perverse" and "unjustifiable," and, after quoting the two questions and answers, Nos. 435 and 436, adds "he did not say that Mr. Haggard might not have said what was imputed to him, about the time of the inception of this new mode; but mere after-dinner gossip, uttered years ago, was not fit matter for evidence on so grave a subject now, especially when Dr. Gray might have assured himself of the facts with very little trouble."

I can only account for the "perverseness" of this statement of Mr. Miller's, "which," let me assure you in his own words "is altogether unjustifiable," on the supposition that he feels the shoe pinch, and despairs of ridding himself of the pressure. The short sentence which I have quoted from his speech, is replete with misstatements. Firstly, Mr. Haggard's statement was not made "about the time of the inception of this new mode," but nearly two years after it came into operation. Secondly, it was no "after-dinner gossip," but a plain straightforward business communication. I have had the pleasure of Mr. Haggard's friendship for 30 years; and can safely testify of him, that he is not a man to make inaccurate or random after-dinner observations, such as Mr. Miller has permitted himself to indulge in, at the meeting of your Society. Thirdly, the statement, when published by me, had not been "uttered years ago," but had been made to me only a few days before the publication of my pamphlet in which it appeared; and if any one is to blame, (which I do not perceive) for its reappearance in my evidence before the commission, it is Mr. Hubbard, one of the commissioners, whose mode of examination, founded on my pamphlet, compelled me to repeat what I had already stated in it. Fourthly, I had "assured myself of the facts" on the subject before I was examined. I had found, moreover, that Mr. Miller had been doing all in his power to obtain a contradiction of Mr. Haggard's statement on authority; and further, that two of the officers of her Majesty's Mint agreed with Mr. Haggard in considering the decimal weight as a disadvantage rather than an advantage, in conducting the business of that establishment. I may add, what it will not be difficult for your readers to perceive, that if Mr. Miller had possessed the means of making a good reply to the statement, he would not have descended to the language which he has thought fit to use, and which I would never have repeated, except in the way of retort.

The subject of the use of decimal weights in the bullion office of the Bank of England, has little bearing on the question of decimal coinage, and would never have been referred to by me, had it not been dragged into the discussion by Mr. Miller and his friends. But now that he has compelled me again to refer to it, I will, with your permission, ask that gentlemen a few questions in relation to it. Will he be so good as to inform your readers:

Firstly. Whether the number of persons employed in the bullion office has not been increased since the introduction of the decimal system of weights, after making all due allowance for any increase that may have been caused by a larger quantity of gold passing through it?

Secondly. Whether any bullion brokers make use of the decimal weights, except in their transactions with the Bank. Whether these brokers do not adhere to the old system of troy weights in all their bank transactions, relating to silver?

Thirdly. Whether goldsmiths and jewellers do not still continue to use troy weight both for gold and silver?

Fourthly. Whether the introduction of the decimal weights did not necessitate the calculation of an entirely new set of tables of the value of foreign coins, for the use of the Bank itself?

Fifthly. How the grain troy (the only weight that will compare with avoirdupois) is to be expressed in the decimal system used at the Bank?

And, lastly, whether the mere cost of a set of weights, representing the decimal subdivisions and multiples of an ounce, say from ·001 to 500 ounces would not require a very large extent of business, like that of the Bank of England, to reimburse the outlay?

I purposely abstained from being present at the meeting, because I suspected what the tone and temper of the discussion would become. "Nonsense," and "twaddle," terms used by Mr. Miller, to designate arguments which he mis-states, might easily be retorted upon himself. I think, for instance, that it would hardly be possible to produce a stronger example of "twaddle" than the wonderful arithmetical discovery which he imparted to the meeting ("to put beyond all question the superiority of the decimal over the present scale, so far as the divisibility of the prices they afford") viz., that the scale of numbers up to 1,000 affords greater number of divisions by the prime numbers than the scale up to 960. Perhaps it may surprise him to learn that the same fact might be adduced to "put beyond all question the superiority" of the guinea unit with its 1,008 farthings over the pound unit with 1,000 mils, and, *à fortiori*, the vast superiority of a unit divided into 10,000 or 100,000 parts.

I refrain from alluding to any other point brought before the meeting, because I find little novelty in any of the arguments employed by the promoters of the pound-and-mil scheme, and because they entirely avoid the practical part of the subject. I can but hope that the time will come when they will descend from the abstract to the practical, and that the examination of the facts of ordinary trade will convince them, if they are open to conviction, of the error of their ways.—I am, &c.,

British Museum, July 28th. J. E. GRAY.

DECIMAL QUESTION.

Sir,—Will you allow me a small space for a remark upon your report of the discussion which was held last Wednesday at the Society of Arts?

Your concluding paragraph would lead the reader to suppose that the second of those questions was disposed of as well as the first. This was not so understood by the meeting. An adjournment *sine die* took place whilst the second question was still under discussion, and, I presume, that when the adjourned meeting is held an opportunity will be afforded for a further expression of opinion. The observations of the speakers on the late occasion were all one-sided, with the exception of those of Mr. Meekins. But the diversity of opinion on this question, that of the best monetary unit, was very great.
—I am, &c., JAMES YATES.

Highgate, July 25th.

Proceedings of Institutions.

Crosby Hall Evening Classes.—The young men constituting these classes made their annual excursion on the 23rd inst. to Hampton Court, under the direction of their friend and founder the Rev. Charles Mackenzie. The weather was singularly favourable for the attractions of the palace, and the presence of a large party of ladies, who took an active interest in the arrangements of the day, added greatly to the general success of the entertainment. A dinner took place on the occasion, and the chairman, in the course of a speech referring to the merits of the Institution, congratulated its supporters that it was free from debt, and that the pupils had greatly distinguished themselves at the recent examinations before the Society of Arts.

To Correspondents.

ERRATA.—In the last number but one of the *Journal*, page 498, col. 1, line 25, for "human blood" read "ox's blood," and page 499, col. 1, line 11, for "manure" read "measures."

PARLIAMENTARY REPORTS.

SESSIONAL PRINTED PAPERS.

PAR. NO.

Delivered on July 18th and 20th.

174. Netley Hospital—Returns.
124. Bills—Public Health Act (1848) Amendment.
117. ——— Clerks of Petty Sessions (Ireland).
120. ——— Commons Inclosure.
127. ——— Police (Scotland).
128. ——— Banking (amended).
129. ——— Boundaries of Land (Ireland) (amended).
130. ——— Industrial Schools (as amended in Committee, on re-commitment, and on consideration of Bill, as amended).
131. ——— Attorneys and Solicitors (Colonial Courts) (amended on re-commitment).
131. ——— Canada and New Brunswick Boundaries.
133. ——— Chelsea New Bridge.
134. ——— Lunatics (Scotland) (amended).
135. ——— Caledonian and Crinan Canals (amended by the Select Committee).

Factories—Reports of the Inspectors (30th April, 1857).
Public General Acts—Cap. 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, and 14.

Delivered on July 21st.

120. East India (Railways)—Return.
137. Audit Office—Return.
176. Public Income and Expenditure (year ended 30th June, 1857)—Account.
191. East India Company (War in China)—Estimate.
182. Mayo County Election Petition—Minutes of Evidence.
187. Galway Town Election Petition—Minutes of Evidence.
121. Bills—Smoke Nuisance (Scotland) Abatement (amended).
136. ——— Ecclesiastical Commission (amended by the Select Committee).
137. ——— Oxford University.

Delivered on July 22nd.

147. Ordnance Survey—Papers.
159. Liverpool Town Dues, &c.—Returns.
172. Land Transport Corps—Report and Evidence.
150. Naval Prize Money, &c.—Account.
156. Chamber of London—Annual Accounts.
160. Broadhaven Harbour, &c.—Report of Captain Bedford.
175. Burials—Copies of Petitions or Memorials.
193. Persian Expedition—Supplemental Estimate.

PATENT LAW AMENDMENT ACT.

APPLICATIONS FOR PATENTS AND PROTECTION ALLOWED.

[*From Gazette, July* 24.]

Dated 20th May, 1857.

1418. Thomas Knight, Upton, Cheshire—An improved cutter and cultivator of land.

Dated 25th May, 1857.

1467. Henry William Ford, Gloucester—Improvements in apparatus for facilitating the draft and locomotion of carriages.

Dated 1st June, 1857.

1544. Henry Davis Pochin and James Woolley, Manchester—Improvements in the manufacture of gum from amylaceous substances.

Dated 6th June, 1857.

1600. Henry Clarke, Horncastle, Lincolnshire—Improvements in the rotary engines.

Dated 12th June, 1857.

1644. John Elce and Samuel Hartley, Manchester—Improvements in machinery for preparing moulds for casting iron or other metals.

Dated 16th June, 1857.

1630. James Cocker, Liverpool—An improved construction of gauge for measuring wire and other articles.

Dated 20th June, 1857.

1734. Lambert Cowell, Adelphi—An improved machine for teaching the art of swimming.

Dated 24th June, 1857.

1759. Richard Morcom, Redruth, Cornwall—Improvements in dressing ores.

Dated 25th June, 1857.

1776. Charles Grafton Page, Washington City, U.S.—Improvements in cylindrical door bolts.
1778. Ernest Auguste Bourry, St. Gall, Switzerland—Improvements in kilns or ovens for burning or baking bricks, tiles, and other earthen or ceramic matters.
1780. John Loach, Birmingham—A metallic air-tight coffin.
1782. Elijah James Crocker, Liverpool—Improvements in the rigging of ships and other vessels. (A communication.)
1786. Jacob Green, Onehouse, Stowmarket, Suffolk—Certain improvements applicable to bedsteads and other articles of furniture, for the purpose of excluding therefrom bugs or other similar insects.
1788. James Lamb Hancock, Pentonville—Improvements in means or apparatus for washing or cleansing.
1790. William Bough, Bunhill-row—Improvements in lamps for burning resin and other oils and fluids, also an improvement in Argand gas burners.
1791. Stephen Bourne, 4, Leonard's-square, Kentish-town—An improvement in the manufacture of felted fabrics.
1792. Howard Glover, Lambeth—An improvement in pump buckets.

Dated 26th June, 1857.

1794. Robert Hattersley, Ardwick, near Manchester—Improvements in machinery for distributing and setting up or composing type.
1796. William Parsons, Brighton—Improvements in fittings to door handles and spindles.
1798. William Crook, Gilbert Rushton, and Joseph Crowther, Blackburn—Improvements in looms.
1800. Michael Michaelis and John Clemson, Manchester—Improvements in the production of ornamental textile fabrics by printing.
1802. Stanislas Gaudrion, 53, Chancery-lane—An improvement in screw-propellers. (A communication.)

Dated 27th June, 1857.

1804. Joseph Pollard, Highdown, near Hitchin, Herts—Improvements in machinery or apparatus for distributing manure.
1806. John Green, Newcastle-upon-Tyne, and William Coppin, junr., Blyth—The preservation of timber.
1808. Pierre Eugène Liger, Rouez, France—Improvements in grinding mills.
1810. George Swindells and Jonathan Arnold, Bollington, near Macclesfield—Certain improvements in spinning and doubling yarns, and in machinery or apparatus of the kind commonly known as mules and twining jennies.
1812. William Edward Newton, 66, Chancery-lane—Improved machinery for grinding the teeth of card cylinders. (A communication.)

Dated 29th June, 1857.

1814. Narcisse Laurent, Paris—Improvements in the process of dressing and manufacturing shammy leather.
1818. James Lawrence, Colnbrook—Improvements in apparatus for brewing.
1820. Henry Gilbee, 4, South-street, Finsbury—Improvements in machinery for moulding vermicelli and other paste. (A communication.)
1822. Gustav Adolph Buchholz, Strasbourg, France—Improved machinery for hulling and cleaning rice, wheat, and other grain.

Dated 30th June, 1857.

1826. Isidore Charles Cloet, Ghent, Belgium—An improved rice and barley-mill.
1830. William Pole, Birdcage-walk—Improved means for supporting telegraph wires. (A communication.)

Dated 1st July, 1857.

1832. Thomas Brewer, Neithrop, Banbury, Oxfordshire—Improvements in machines for cutting and reducing turnips or other vegetable substances.
1834. Carl Johann Lawrence Leffler, Westbourne-terrace—Improved machinery for cutting corks, bungs, and other similar articles. (A communication.)

Dated 2nd July, 1857.

1838. Andrew Smith, Princes-street—Improvements in the construction of life boats and other boats or vessels.
1840. Augustus Philibert Malard, 39, Rue de l'Echiquier, Paris—Certain improvements in filtering water and other liquids.
1842. Thomas Moy, Clifford's-inn—Improvements in the mode of working steam engines.
1844. Edward Taylor Bellhouse, and William John Dorning, Manchester—Improvements in steam boilers.
1846. George Davies, 1, Serle-street, Lincoln's-inn—An improved marine steam-engine governor. (A communication.)
1848. Tomyns Browne, Liverpool—An instrument for ascertaining the true or actual acclivity and declivity of bodies.
1850. William Rowan, Belfast—Improvements in steam boilers and furnace flues.

Dated 4th July, 1857.

1865. Michael Henry, 77, Fleet-street—Improvements in machinery or apparatus for cutting vegetable substances. (A communication.)
1867. George Cooper, Sheffield—Improvements in safety lamps.
1869. Joseph Mills, Leicester—An improved method of coverin ricks, booths, tents, and such like places.

Dated 6th July, 1857.

1871. Thomas Bowden, Pendleton—Improvements in apparatus for discharging the water resulting from the condensing of steam used in apparatus heated by steam.
1873. Frank Clarke Hills, Deptford, Kent—Improvements in the manufacture of sulphuric acid.

Dated 7th July, 1857.

1875. John Alison, Hainault Forest, Essex—Improvements in preparing vegetable substances for feeding animals, and in apparatus for that purpose.
1877. Wilhelm Adolf von Canig, Leipsic, Saxony—A new or improved compound or composition to be used as a substitute for gum, paste, and other adhesive materials, and for finishing, sizing, or stiffening fabrics and other articles to which the same is or may be applicable.
1879. Joseph Platt, Audlem, Cheshire—Improvements in gun locks.
1881. John Speight, Bradford—Improvements in wool combing, and in machines known as "Colliers's combing machine."
1883. Peter Hippolyte Gustave Bérard, 323, Rue St. Denis, Paris—Improvements in manufacturing azotic cotton or pyroxile for photographic and other purposes.
1885. John Louis Jullion, Foot's Cray, Kent—The mechanical and chemical separation of solids from fluids.
1887. Richard Archibald Brooman, 166, Fleet-street—The manufacture upon circular frames of a fabric suitable for petticoats and other garments, curtains, and other articles of furniture. (A communication.)
1889. William Burgess, Newgate-street—Improvements in reaping and mowing machines.
1891. Michael Henry, 77, Fleet-street—Improvements in railways and waggons used therewith in loading and discharging coals, stones, ballast, earth, and other materials. (A communication.)

Dated 8th July, 1857.

1893. John Talbot Pitman, 67, Gracechurch-street—A conical tent. (A communication.)
1895. Thomas Frederick Henley, Bromley—Improvements in the preparation or manufacture of certain beverages or liquors of the nature and character of home-made wines, and in the means of obtaining the same.
1897. Joseph Gibbs, Abingdon-street—Improvements in extracting gold and silver from their matrices, and from other substances or materials with which they are combined, mixed, or associated.
1899. Edward Taylor Bellhouse, and William John Dorning, Manchester—Certain improvements in hydraulic presses.
1901. Louis Albert Bahn, Greek-street, Soho—Improvements in galvanizing metals, and in the apparatus employed therein.
1903. Robert Moore, Isleworth—Improvements applicable to navigable vessels and the propelling thereof.

Dated 9th July, 1857.

1905. Charles Patrick Stewart, and David Graham Hope, Manchester—Improvements in the valve gear of locomotive and other engines.
1907. John Dunsmore Mac Nicol—Improvements in machinery or apparatus for cylinder printing.
1909. John Scott Russell, Millwall—Improvements in apparatus and slips for moving ships and vessels out of, and into, the water.
1911. Dr. Cosmo Logie, Royal Horse Guards—An improvement in, or addition to, fire-arms.
1913. Florentin Delmas, Paris—Improvements in ventilating ships, mines, and other places.
1915. William Johnson, 47, Lincoln's-inn-fields—Improvements in capstans. (A communication.)

Dated 10th July, 1857.

1917. Charles de Bergue, Dowgate-hill—An improvement or improvements in the manufacture of apparatus for condensing and cooling purposes.
1919. Isac Louis Pulvermacher, Paris—Improvements in pipes and tubes for smoking.
1921. Sir Francis Charles Knowles, Bart., Lovell-hill, Berkshire—Improvements in the manufacture of iron.
1923. John Gill, Newtyle, Forfar, N.B.—Improvements in reaping machines.
1925. James Moon, Malton, and Robert Belt and George Ewbank, Lutton, Yorkshire—An improved agricultural implement.
1927. Webster Woodman, 14, Boulevart Montmartre, Paris—Improvements in railroad wheels. (A communication.)
1929. Richard Hornsby, junr., Spittlegate, near Grantham, Lincolnshire—Improvements in apparatus for hummelling, removing the husk from, and cleansing grain.

Dated 11th July, 1857.

1931. Edouard Primard, Paris—Improvements in treating auriferous, argentiferous, or other metallic ores.
1933. Datus Ensign Rugg, New York, U.S.—An improvement in water-guages for steam boilers.
1935. François Burot, Rue Neuve des Mathurins, 57, Paris—A new process for gilding and plating over silk, cotton, wool, and all other textiles and fibrous matters.
1939. Alexandre Amand Noel Dépinhay-Pre-Hamon, Paris—Improvements in windmills.

Dated 13th July, 1857.

1941. Henry Starr, Liverpool—Improvements in hinges. (A communication.)
1943. Nicholas Williams and Thomas Williams, Helston Foundry, Helston, Cornwall—Improvements in the form and arrangement of the driving gear of thrashing machines, and in the form and mode of applying the straw shakers to such said machines.
1945. James Heywood Whitehead, Royal George Mills, Saddleworth, Yorkshire—Improvements in milling endless cloths.
1947. William Edward Newton, 66, Chancery-lane—Improvements in the manufacture or reduction of platinum. (A communication.)
1949. William Edward Newton, 66, Chancery-lane—An improved mode of preventing incrustations in steam boilers. (A communication.)

Dated 14th July, 1857.

1951. Barnabas Urry, Vectis Works, Newport, Isle of Wight—Improvements in seed-drills.
1953. Frederick Crace Calvert, Manchester, and Charles Lowe, Halifax—Improvements in the manufacture of size.

WEEKLY LIST OF PATENTS SEALED.

July 24th.

218. Charles James Wiggs.
238. William Allen Turner.
258. George Edward Dering.
260. Charles Edward Symonds.
263. George and Joseph Sampson, and Elijah Ledger.
288. Duncan Morrison.
296. William Dray.
301. Jean François Dudebout.
324. Charles de Bergue.
331. Philipp Schafer and Frederick Schafer.
354. Joseph Nicolas Victor Cadiat.
376. Henry Willis.
387. August Frederick William Partz.
422. Charles Crossley, Dan Leeming, and John Crossley.
437. Andrew Barclay Walker.
448. William Edward Newton.
536. Claude François Latruffe.
583. William Edward Newton.
632. Thomas Brown.
687. William Edward Newton.
839. Charles Cowper.
846. George White.
879. John Henry Johnson.
894. Robert Alfred Wright and Louis Jules Fouche.
1008. Robert Turnbull.
1192. Wilson Ager.
1224. G. Tomlinson Bousfield.
1393. Richard Bradley and William Craven.

July 28th.

265. Charles de Bussy.
267. William Weild.
270. John Talbot Pitman.
277. Frederick William Campin.
282. Henry Smith.
283. Thomas Affleck.
284. James Owen.
298. Cotton Symonds.
305. Robert Morrison.
307. Thomas William Rayner.
308. James Hunt.
340. Rd. Archibald Brooman.
358. Felix Lieven Bauwens.
359. Thomas Brown and George Parry.
360. Rd. Archibald Brooman.
361. Rd. Archibald Brooman.
372. David Falconer Wright.
395. Henry Heald and Arthur Heald.
410. Peter Hubert Desvignes.
432. George Hardstaff.
441. Josiah Firth and Joseph Crabtree.
489. William Clark.
508. John Whitehead.
553. Louis Emile Ossian Degrand.
598. James Murphy.
608. Charles Pauvert.
609. Charles Pauvert.
610. Charles Pauvert.
753. William Mac Naught.
1447. Frederick Walton and John Pinson.

Patents on which the Stamp Duty of £50 has been Paid.

July 20th.

1604. John Knight and James Stubbs.
1621. Richard Roberts.

July 22nd.

1616. William Septimus Losh.
1630. Ephraim Hallum.
1633. Thomas Bell and Henry Scholefield.

July 24th.

1627. Francis Preston.
1643. Louis Christian Koeffler.
1650. Auguste Edouard Loradoux Bellford.
1667. Amable Hippolyte Petit.

July 25th.

1661. Alexander Law.
1732. Thomas Waterhouse.

WEEKLY LIST OF DESIGNS FOR ARTICLES OF UTILITY REGISTERED.

No. in the Register.	Date of Registration.	Title.	Proprietors' Name.	Address.
4010	July 24.	The Corded Leopold Shirt Collar	Jas. Welch and John Stewart Nicholson	16 and 17, Cheapside.
4011	" 25.	The Inverted Postage and Receipt Stamp Damper	White and Ball	9, St. John's-square, Clerkenwell.
4012	" 27.	Curtain Support for Wash-hand Stands, Windows, and other situations where curtains are required ..	Abel Stokes	Birmingham.
4013	" 28.	Knee Protector	Joseph Hutchings	4, Charles-street, Trevor-square, Brompton.

Journal of the Society of Arts.

FRIDAY, AUGUST 7, 1857.

NOTICE TO INSTITUTIONS.

The Council having purchased from the Messrs. Longman a number of copies of the Society's Reports on Industrial Instruction, for the use of the Institutions in Union, the Secretary will be prepared to send copies, free of charge, to any of the Institutions applying to him for them.

YORKSHIRE UNION OF MECHANICS' INSTITUTES.—ANNUAL MEETING.

The annual meeting of the Yorkshire Union of Mechanics' Institutes took place at Huddersfield, on Wednesday, the 29th July.

The Conference took place in the Gymnasium-hall, at eleven o'clock. Edward Baines, Esq., president of the Union, occupied the chair; and the delegates and visitors present were:—

Lord Goderich, M.P.; Mr. Edwd. Akroyd, M.P., Mr. Commissioner Hill, Recorder of Birmingham; The Rev. Dr. Booth, Chairman of the Council of the Society of Arts, London; Mr. P. Le Neve Foster, Secretary of the Society of Arts; the Hon. and Very Rev. the Dean of Ripon; Mr. W. Willans, Huddersfield; Mr. Edward Baines, Leeds; Mr. T. P. Crosland, Huddersfield; Mr. William E. Forster, Burley, near Otley; Mr. George Armitage, Huddersfield; Rev. R. Bruce, M.A., Huddersfield; Rev. J. K. Montgomery; Mr. C. D. Hardcastle, Keighley; Mr. Jere Thornton and Mr. John Ashwick, Adwalton; W. H. Thornton, M.D., Dewsbury; Mr. J. Hole, Leeds; Mr. James Hanson, Huddersfield; Mr. Henry Habershon, Rotherham; Mr. John Pogson, Mossley; Mr. Booth, Rotherham; Mr. Jno. Hixon, Holmfirth; Mr. S. Rayner, Pudsey; Mr. Josh. Lobley, Leeds; Mr. Samuel Idle, Leeds; Mr. Thomas Hudson, Kirby Malzeard; Mr. C. H. Bairstow, Spofforth; Mr. W. P. Wood, Leeds; Mr. J. B. Lockwood, Hebden-bridge; Mr. J. B. Smith, Haworth; Mr. B. Blake, lecturer to the Union; Mr. J. Farrar, sen., Bradford: Mr. J. W. North, York; Mr. J. Wright, jun., York; Mr. Jno. Ellerby, Castle Howard; Mr. Wm. Taylor, Middlesborough; Mr. B. Baxter, Leeds; Mr. J. Jowitt, Leeds; Mr. Geo. Dawson, Selby; Mr. Francis Moore, Wentworth; Mr. W. Smith, jun., Morley; Mr. L. Cooke, Richmond; Mr. J. W. Carlile, Meltham; Mr. Josh. Scarth, Churwell; Rev. T. B. Bensted, M.A., Lockwood; Mr. John Newall, Bingley; Rev. Lewis Jones, Almondbury; Mr. Richard Wilson, Bramley; Mr. Samuel Bailey, Scarbro'; Mr. S. Wimpenny, Holmfirth; Mr. C. T. Philips, Ossett; Mr. Josh. Buller, Hepworth; Mr. John Room, Keighley; Mr. Wm. Crowther, Gomersal; Rev. J. Bateman, LL.D., Mossley; Mr. J. W. Wood, Northowram; Mr. W. P. England, Huddersfield; Mr. P. B. Shaw, Huddersfield; Mr. Wm. Field, Brighouse; Mr. G. H. Manks, Brighouse; Mr. W. R. Milner, Wakefield; Mr. John Binks, Wakefield; G. Fearnley, M.D., Dewsbury; Mr. John Newby, Ackworth; Mr. F. W. Sucksmith, Birstal; Mr. Wm. Osburn, Leeds; Mr. David Morris, Hon. Sec. of Lancashire and Cheshire Union; Mr. Thomas Burnley, Gomersal; Mr. E. Kenion, Bradford; Mr. G. Townend, Thornton; Mr. John Reynolds, Castleford; Mr. Josh. Horn, Castleford; Mr. Wright Mellor, Huddersfield; Mr. George S. Tolson, Huddersfield; Mr. Edmund Eastwood. Huddersfield; Mr. James Kidd, Southowram; Mr. John Womersley, Southowram; Mr. John Whitworth, Mayor of Halifax; Mr. Thomas Cutting, Selby; Mr. Josh. Wrigley, Netherton; Mr. John Andrew, Leeds; Mr. W. C. Horsfall, Calverley; Mr. J. B. Robinson, Marsden; Mr. Bentley Shaw, Lockwood; Mr. Wm. Corke, Halifax; Mr. A. Mac Ivor, Leeds; Mr. Thomas Dawson, Leeds; Mr. Samuel Hick, Leeds; Mr. Robert Smailes, Castle Howard; Mr. Sidney Wolf, Knottingley; Mr. John Brook, jun., Huddersfield; Mr. John Freeman, Huddersfield.

The President said he had the pleasure of congratulating them upon the arrival of the twentieth anniversary of the Yorkshire Union of Mechanics' Institutes. It was a most gratifying thing that this Union had existed over the long period of twenty years, with unbroken harmony; and during no portion of that time had it been more efficient, more extended, or its operations more satisfactory or more hopeful than at the present moment. They had gone on with almost continuous progress. The number of institutions had steadily increased, though of late years the number in connection with the Union had not so much augmented as they would have liked. But he knew for a fact that a great number of Institutions of a kind somewhat analogous had been formed in the country, but not joined to the Union. He regretted that these Institutions had not joined the Union, as he believed—and the delegates would believe—that they would have gained great advantages from that connection. As he had said, they met under circumstances of peculiar interest, on one or two accounts especially. Their happy connection with that important metropolitan society, the Society of Arts, was that day made manifest. They had representatives of that Society amongst them; and in the course of the day a most important duty would be discharged by the Chairman of the Council and other gentlemen connected with the Society of Arts in the distribution of prizes and certificates to the successful competitors from Mechanics' Institutions of Yorkshire and neighbouring counties. They felt that this was one of the fruits which had followed the establishment of a Union like that which now existed; indeed, he might almost say that without that Union it was not very likely that they would have seen this series of examinations. He believed he might say, in the presence of Dr. Booth and Mr. Foster, that the Yorkshire Union was in some measure an inducement to the formation of the more important union of which they had to-day one of the fruits; and they of the Yorkshire Union had done their best to cheer the Society of Arts in its important enterprise, more especially in coming down to make the recent examinations. He was most happy to see Dr. Booth and Mr. Foster amongst them; and for their future encouragement and support he might say that the report which would come before the meeting would be of the most gratifying and encouraging character. It was not for him to say what the precise nature of the report would be; but he might state that Dr. Booth had assured him that it was of a very satisfactory and gratifying nature. (The Dean of Ripon here entered the room and was loudly cheered.) They did not forget their old friends, and their old friends had not forgotten them. They had the very apostle of Yorkshire Institutions amongst them; and it was clear they had not forgotten their old friends, although they had so many men of great distinction and ability to cheer them forward, and give them their aid. They had never met in the town of Huddersfield without great advantage, because they all recognised it as having the best Institution in Yorkshire, and one of the best in England. Their object in meeting together was to prove what might be done by Institutions of this nature, and to give each other the benefit of their united experience; but he confessed that they had come to Huddersfield to learn rather than to teach, and expected to receive more than they could bestow. Let him remind them of the resolution passed at their last annual meeting in favour of a plan which he had taken some pains to recommend for their approval, namely, the appointment of canvassing committees, for canvassing for members towards the close of the year of the Institution. Reference would be made to this subject in the report, and he hoped that it would not be forgotten. He believed that it was of great importance; and there were gentlemen present who could testify to the way in which the numbers in their Institutes had been augmented by the operations of canvassing committees. They did not meet for speeches that morning—they would have the eloquence in the evening; but to talk, and to communicate their experience. They would now hear the report; it was one of great ability, and he could say this with the greater freedom as it was the report of their excellent secretary. It comprised many questions of great importance connected with the Mechanics' Institutions, and he knew the delegates would listen to it with great attention. Before the report was read, however, they must proceed to the election of an auditor.

After the election of an auditor for the ensuing year, Mr. James Hole, Secretary, read the report of the central committee, of which the following are the principal portions:—

"In presenting the twentieth annual report of the Yorkshire Union to the representatives of the various Institutes included therein, your committee do so with peculiar pleasure. This occasion is signalised by an event of no common importance—its connection with those examinations which have been inaugurated and so effectively carried out by the Society of Arts. Since the first establishment of Mechanics' Institutes, this is the greatest event in their history. It is the best endeavour that has yet been made to render these Institutions more educational. It enforces the recognition of the principle, on the part of their conductors and that of the public generally, that, whatever else may be the function of these Institutes, that of affording means of regular and systematic study is their primary and most important one. The system which has been called into action by the Society of Arts is an invitation to every young man, however poor in purse and humble in rank, to enter on the path of self-improvement; it points out to him the various departments of study which he may pursue as inclination or the demands of his occupation may suggest to him; it indicates to him the most useful text books for his assistance; it furnishes men of the highest qualifications willing to test his acquirements; and, above all this, it offers him certificates of his proficiency in the degree that he deserves them, or, in the event of his manifesting more than ordinary merit and abilities, he receives the distinction of a prize. Your committee regard the distribution of certificates of even more value than the prizes, because the former may be obtained by every pupil who deserves them, whereas in the case of prizes, though the most deserving may obtain them, many very meritorious students must go without them. Besides, from the fact that between four and five hundred of the largest employers and leading firms in the country have formally declared their intention to regard such certificates as 'testimonials worthy of credit,' their possession by a young man forms an introduction of no ordinary value. That the system of examination thus commenced by the Society of Arts deserves, and will receive, a fitting response from the Institutions, there will, your committee trust, be furnished abundant evidence this day. Many of the local committees have thus been stirred up to renewed exertions for the improvement of their classes, and have been rewarded by a proportionate success. It will be one of the subjects for discussion at this morning's meeting, to consider how these examinations of the Society of Arts shall be perpetuated. Most melancholy would it be if the present auspicious beginning should prove a mere isolated event, and the advantages anticipated by all friends of popular improvement from the present movement be doomed to disappointment. It ought also to be matter for consideration at this conference, assuming that the general examinations of the Society of Arts can be, as they ought to be, rendered a permanent feature of the organisation of these institutes, how some provision might be made for holding preliminary examinations of the pupils. This would save the Society of Arts' examiners an amount of needless drudgery, which indeed, unless this plan be adopted, might be fatal to the scheme.

"With respect to the special operations of the Union, we have to inform you that during the past year the Agent of the Union, Mr. Barnett Blake, has delivered 113 lectures, addressed 31 meetings or soirees, and made 86 visits to Institutions, being a total of 230 attendances at Institutes. The 86 visits were for the purposes of the formation of new Institutes, or the improvement of existing ones, and 36 of these visits were to new places. During the past year twelve new institutes have been commenced, and your committee have reason to believe that the services of your agent have been useful to all of them, and in some instances have been mainly instrumental in calling the Institutes into existence. In the discharge of his duties, so far as they come under the supervision of your committee, they have every reason to be satisfied with his ability, attention, and punctuality, and they hope that his services are as satisfactory to the Institutes as they are to your committee.

"Owing to the absence, on the continent, of the honorary secretary of the Village Library, its operations during the past year have not been so successful as could have been wished. A considerable amount of good, however, has been achieved, and in three places since the last report, the loan of the books has led to the establishment of independent libraries. Your committee have made arrangements for carrying out the objects of the library vigorously during the ensuing year. The suggestion thrown out in the last Union report, of organizing a method of introducing and assisting the Village Library, by means of a system of village lectures, has been again under the consideration of your Committee, and it has been determined to commence the plan as soon as sufficient funds have been subscribed to purchase the necessary apparatus. This will amount to about £50, towards which £20 is already subscribed, including a handsome donation of £5 from John Crossley, Esq., and your committee hope that the friends of education will furnish them with the small amount still requisite, in time to commence the plan with the ensuing winter.

"The treasurer's account shows a balance in favour of the Union of £29 17s. 3d. As the last account showed a balance due to the treasurer of £29 9s. 7d., it would appear that the funds of the Union are in a more satisfactory state; but it will be seen that the receipts include a balance of Lord Ashburton's donation amounting to £32 14s. 6d., and as this sum will be specially appropriated, there will still be a small balance against the Union. At the same time, the committee would remark that its operations are considerably contracted from want of adequate pecuniary resources, and, therefore, while they have much ground for hope in their diminishing liabilities, they rely upon receiving additional aid from the public in order to render the Yorkshire Union as fully efficient as possible. Your committee regret to announce that the treasurer, Mr. W. B. Denison, has resigned that office, which he has held during the last three years, with very great advantage to the Union, and while its pecuniary difficulties were considerable. Henry Oxley, Esq., has kindly consented to accept the office of treasurer, and as the financial position is better than heretofore, your committee trust that it will be so much improved by additional subscriptions that the operations of the Union may be unembarrassed.

"As far as the returns from the Institutions enable your committee to present the statistics of the Union, they show the following result:—

Number of Institutes in the Union		129
Last year, 130; ceased to exist, 8; withdrawn, 5; new Institutes joined		13
Total number of members estimated at		20,960
Number of members reported in 94 Institutes—Males	16,519	
” ” ” Females	1,088	
		17,607
Annual Income of 85 Institutes		£10,073
Number of volumes in the libraries of 91 Institutes		100,994
Number of issues of books in 80 Institutes		279,714
Number of issues to each member		18.1
Number of books added during the year to 87 Institutes		7,208
(Being an increase of 7.1 per cent.)		
Number of periodicals taken in 85 Institutes:—		
Weekly	182	
Monthly	534	
Quarterly	74	
		790
Newspapers		690
Number of lectures delivered at 88 Institutes		710
Of which 124 were paid, and 586 gratuitous, and they have been classified as follows:—		
Scientific	204	
Literary	469	
Musical	37	
	710	
In 70 Institutes, containing 15.203, the number of pupils belonging to classes is returned		5,870

COMPARATIVE TABLE.

	1856.	1857.	Increase. No.	Increase. p.ct.	Decrease. No.	Decrease. p.ct.
Members in 87 Institutes...	16,677	16,862	185	1.1		
Do. 49 do. ...	6,837	8,139	1,302	19.		
Do. 38 do. ...	9,840	8,723	...	...	1,117	11.3
Females in 39 do. ...	1,064	898	...	...	166	15.6
Income of 77 do. ...	£9,616	£9,814	£198	2.0		
Lectures at 71 Institutes ... Paid	117	119	2	1.7		
Lectures at 71 Institutes ... Unpaid ...	481	457	...	...	24	5.0
Books in libraries of 89 Institutes........................	93,786	99,438	5,652	6.0		
Issues do. 73 do. ...	269,909	270,720	811	0.3		
Pupils in classes of 42 do...	4,240	4,409	169	4.5		

"On the whole, these facts are highly encouraging as indicating an increase in the funds and in books, besides a marked improvement in the class department, though this as yet is far from being in a satisfactory state, and much, very much, remains to be done. The importance of more energetic exertions in the promotion of evening schools and of classes in Mechanics' Institutes has become increasingly manifest from the proceedings at the recent important Educational Conference in London. That conference, consisting of the most active promoters of education, and all sects and parties, established the conclusion, that the short period the children of the working classes remain at school, and the early age at which they quit it, deprive the instruction received there of most of its value.

"The reports show that a reasonable increase of the fees above their absurdly small amounts, does not in general produce the effect anticipated by some persons, of diminishing the number of members, provided the one essential condition of improving the quality of the instruction in an equal degree be observed. Even with a very considerable amount of external assistance, it is not practicable to give mere elementary instruction of a tolerable quality for the sum of 1d. or 2d. per week, with the benefits of the library, lectures, and a news-room frequently thrown in. The returns of the Union show that the subscriptions range from 4s. to 10s. per year, the average being 1½d. per week. The low subscription, quite as much as the deficiencies of the pupils, causes the education to be of an elementary and very inferior character. In the 67 best Institutes of Yorkshire, containing 14,059 members, there were in classes 5,754, or 41 per cent., and of these 5,754 pupils, 4,315, or 75 per cent., were learning merely reading, writing, and arithmetic. On the other hand, if the instruction were made better, if the pupil were made to feel that he actually derived some real instruction, that he got value received, he would more readily pay 4d. or 6d. per week, than he now does 1d. or 2d.

"One of the most discouraging facts indicated by the return is, that the same Institutes contain 15 per cent. fewer females than last year, and last year's comparison showed a diminution in the females of 10 per cent. There are fewer females reported this year in 90 Institutes than there were last year in 75 Institutes.

"The comparative table shows a considerable diminution of lectures, and, indeed, in a very considerable number of Institutes, the reports complain of the small attendance at lectures, and, generally, of the want of interest in this department of the Institution. In some places, however, lectures still possess a considerable degree of attraction. If not the most valuable, yet as one important instrument of popular instruction, it would be a matter of regret, if they fell into discredit.

"The Wakefield and also the Hull Institutes have become the depositories of the Specifications of Patents, a most valuable and extensive collection, forming about 400 volumes. This advantage might be enjoyed by many other Institutes situated in large towns provided they would furnish the proper accommodation for them. One of the conditions on which they are granted is, that the public shall have free access to them; but this there would be little difficulty in arranging, and to many Institutes it would be a positive advantage, considered merely as an advertisement.

"Your committee can but allude to one other matter of practical importance, the regular collection of the subscriptions. At the Middlesbro' Institute, finding the interest of the public languish, the committee appointed a paid collector, which had the very beneficial effect of increasing the number of members from 181 to 296. At Brighouse the employment of a paid canvasser and collector raised the income from £72 to £120. At Dewsbury the members were increased from 147 to 232, principally by the exertions of a canvassing committee. The adoption of this plan would rescue many a falling Institute from its difficulties, and no Institute that means to conduct its operations with any vigour can dispense with it."

Mr. Barnett Blake, agent and lecturer to the Union, next read his report.

The Rev. Mr. Bensted, in moving the adoption of the report, observed that it was highly important that these reports should be printed and circulated, but of infinitely more importance that they should be read,—it was very easy to print them, but extremely difficult to get people to read them. If such an interesting report were read by the subscribers to the Institutes, they would give the Union a much warmer support than they did, while those not members would doubtless be induced to join. He therefore suggested that the delegates should not only circulate the reports, but obtain readers of them.

Mr. Francis Moore (Wentworth) seconded the resolution.

Mr. Farrar, President of the Bradford Mechanics' Institute, said that the report just read was one of the very best reports they had had since the formation of the Union, and he trusted that the committee would now carry out a recommendation he made at the last annual meeting, that a larger number of reports be printed, and distributed throughout the length and breadth of the land.

Mr. Morris, Secretary to the Lancashire and Cheshire Union of Mechanics' Institutes, said the report could not be printed without money. He would, however, refer to what was done in the Institution with which he was connected, last year, after the meeting at Middlesbro'. He summoned a meeting of the members, and gave them a description of the Middlesbro' meeting, and, a week afterwards, he and one of the members of the adult reading class read over the whole of the report, and selections from the reports forwarded by Institutions in the Union. Next Friday night they intended to read Mr. Hole's admirable prize essay on Mechanics' Institutes. He suggested that the delegates, on their return home, should read the report to their members, and also give them the best possible description of their proceedings at Huddersfield.

Mr. Blake said that the committee printed as many copies of the report as they could afford.

The Dean of Ripon said, in his opinion a printed report of an institution was very much like a dose of physic, and very unwillingly taken indeed. At the same time, he acknowledged its advantages. He had once made a calculation, and found that the money given to all sorts of Institutions, was nearly all sunk in the printer's shop. It was not an ill-advised recommendation that the report should be read at every Institution; in fact, it should be made a condition of union, or at least a very strong exhortation should be made that the suggestion thrown out should be adopted.

Dr. Booth was very much gratified by hearing the very able report now presented. The report would be distributed very much over the country by its being published in the *Journal of the Society of Arts.*

The Conference then adopted the report, a Delegate observing that, in the medium announced by Dr. Booth, it might be obtained at 3d. per copy.

The meeting then proceeded to appoint the officers for the ensuing year, and to take into union 13 new Institutions.

The next annual meeting was then fixed to be held at Selby; and the following resolution was passed:—"That the thanks of this meeting be given to the Society of Arts for the encouragement which it has afforded to the Institutes in Union by holding examinations at Huddersfield, and also to those gentlemen who have so munificently contributed to the fund for prizes." This was acknowledged by Dr. Booth, on behalf of the Council of the Society of Arts.

The Society of Arts' Examinations, and the best means of rendering them a permanent agency in the operations of Mechanics' Institutes, was the first subject for discussion, and Dr. Booth was called upon by the Chairman to open the subject.

Dr. BOOTH said he considered the prize fund injudicious, as the candidate who gained the prize in any class threw the other competitors into the shade to an extent which the examination did not justify. If these examinations were to be permanent, the certificates must be stringent, truthful documents, recording the attainments of the young men themselves. Prizes might be very useful to inaugurate these examinations, but they should not be regarded as a part of the system. Whether these examinations were to be permanent, or a mere flash in the pan, depended upon the question whether the great employers of labour would look upon these certificates as documents which should be accepted as *bonâ fide* recommendations to young men, to be received into their service, other things being equal. Upon the mode in which these certificates were received by the employers of labour depended the success of these examinations and their permanence. If these certificates were to be regarded as mere waste paper and ornament, then these examinations would fall through, and become among the things that had been. Complaints had been made to him in Huddersfield last year as to the throwing these examinations open alike to those who were members of Mechanics' Institutions, who had to work hard all day, and had only night for study, and those who had full opportunity, in public and private schools, for acquiring knowledge. The objection was founded upon the idea that the members of Mechanics' Institutes would be subjected to an unfair competition. But what was the fact? Of the eighteen prizes allotted, no less than sixteen went to young men in Mechanics' Institutions. The answers were matter of deep surprise to the professors who made the examinations. The number of marks given in history and literature was 500, and 400 was set down as the number which would entitle to a first-class certificate. Two of the young men from Mechanics' Institutes obtained the full number of 500 marks. But they had had very bad answering upon the common subjects of English education, which had not received sufficient attention. They had not found amongst the competitors that proficiency in reading, spelling, and arithmetic which they had anticipated. Where was the wisdom of a man devoting himself to the higher branches of science if he wanted the mere mechanical art of reading and spelling? They would never make these examinations a success, unless sufficient attention were paid to these branches of a common English education. Depend upon it, manufacturers and employers of labour would attach very little importance to a man's proficiency in mathematics, if he were destitute of the knowledge which was wanted in everyday life.

Mr. W. E. FORSTER concurred in the observation of Dr. Booth, that it would not be well to rely upon prizes for the sustenance of these examinations; still, they would be unwise if they abandoned the competitive principle, and the principle of ranging the candidates according to their acquirements, as was the case in the universities. That was the only way in which they could give talent and industry their proper position and reward. Without concurring in all that had been said about giving holders of certificates a preference over all other applicants for employment, he was satisfied that all employers would see that the successful competitors possessed qualities which would be a recommendation to their employment. These certificates would tell in a commercial point of view.

Dr. BOOTH stated that they had three classes of certificates, so that they had the competitive principle without prizes.

In answer to a question, Dr. BOOTH said that the declaration, which was signed by 500 employers, did not go far enough. The certificates were declared to be "testimonials worthy of credit;" but they wanted something more than this negative declaration.

The Rev. Mr. Bensted, Dr. Thornton, Mr. McIvor, (Leeds), Mr. Freeman (Huddersfield), Mr. Cutting, Dr. Fearnley (Dewsbury), the President, Mr. Moore (Wentworth), Mr. Hirst (Meltham), the Rev. R. Bruce, and Mr. Hanson, then took part in the discussion, which closed by

Dr. BOOTH stating that if the Society of Arts received the encouragement it had done hitherto, it would not only continue, but extend its examinations throughout the country. London would be the first centre, and after London, Yorkshire. From the first, the Society of Arts had received the warmest encouragement from Mr. Baines, Mr. Hole, and the Yorkshire Union; and he might say, that if the Society of Arts had a second centre it would be in Yorkshire; but whether in Leeds, Halifax, York, or elsewhere, it would be for the Yorkshire Union to decide.

The meeting then proceeded to discuss, "The most practicable means of rendering Mechanics' Institutes self-supporting;" the necessity for the "Instruction of Females in needlework and plain dress-making;" and "The value of Evening Classes, on the principle of mutual instruction, as a means of promoting the study of science and literature," when the Conference terminated.

The Annual Dinner took place at half-past three, under the presidency of Mr. G. S. Tolson. About 170 persons were present.

THE SOIREE AND DISTRIBUTION OF PRIZES.

At half-past six o'clock in the evening the distribution of the prizes and certificates of the Society of Arts, to the members of the Northern Mechanics' Institutes who have successfully competed in the examinations of the Society, took place in the Riding School. The building was tastefully decorated for the occasion. The galleries were hung round with red cloth, and the room in all directions festooned with evergreens, banners of various shapes and sizes, bearing appropriate mottos on the subject of education, &c. The interior of the building was crowded in every part, the front seats being occupied by a highly-respectable company, and the galleries, while filled with perhaps humbler persons, contained a company as much, or more deeply interested in the proceedings than the others. On the extreme right and left of the noble chairman, the delegates sat on seats appropriated to their use, while immediately surrounding him were the gentry of the West Riding and others.

As previously announced, the Right Hon. the Earl Granville, President of the Council, took the chair. Upon the platform were Viscount Goderich, M.P., R. M. Milnes, Esq., M.P., H. W. Wickham, Esq., M.P., Edward Akroyd, Esq., M.P., Frank Crossley, Esq., M.P., Sir J. Richardson, J. P. B. Westhead, Esq., M.P., Mr. Commissioner Hill, the Hon. and Very Rev. the Dean of Ripon, Rev. Dr. Booth, P. Le Neve Foster, Esq., Edward Baines, Esq., J. W. Childers, Esq., George Armitage, Esq., Edward Brooke, Esq., Frederick Schwann, Esq., J. C. Laycock, Esq., W. Willans, Esq., G. S. Tolson, Esq., W. E. Forster, Esq., Rev. S. Holmes, M.A., (vicar of Huddersfield), John Brooke, Esq., of Armitage-bridge, T. Mallinson, Esq., T. P. Crosland, Esq., Thomas Firth, Esq., John Botterill, Esq. (Mayor of Leeds), John Whitworth, Esq. (Mayor of Halifax); P. O'Callaghan, Esq., &c.

The Earl GRANVILLE said,—Ladies and Gentlemen: Standing as I do here a perfect stranger, not only in Yorkshire, but in the very centre of the West Riding, I feel that some apology is due from me for occupying this most important position. But it has been through life my rule that, when there has been a good cause in hand, and when persons, on whose judgment I can rely, advise me to take part in it, I take that part without the consideration of how little fitted I may be to fill it. I am perfectly aware that the post I occupy has both its privileges and its duties. Its duties I consider to be of a very light character this evening. I believe the principal one is to maintain order and harmony in this assembly, and I cannot help thinking that it will be something of a sinecure. The privileges are great ones. The one to which I attach the greatest importance is, the privilege of handing prizes to those young men who have become the first examples of what I believe to be a system fraught with immense good. Another which will be accorded to me, according to custom, is the privilege of being somewhat long in addressing you this evening—taking advantage of being the first speaker, and, as it were, skimming the cream of your attention and speaking my own sentiments at very considerable length. Although your own good nature might allow it; although some of us, having just dined, might have been put into good humour; and although some of us may have come back elated with the cheap bargains which we have secured at the bazaar this afternoon—yet I believe that one of the characteristics of Yorkshiremen is to put a certain value upon time, and prefer those who act, instead of those who talk too much. Therefore, I will take the liberty of occupying only a very short time in addressing you. I consulted a Yorkshire friend of mine last night as to the best course I could pursue this evening—a friend in whom I could place implicit reliance. He said he thought the best course would be to make some general remarks on the advantages of education. On considering this advice, and on looking at the assembly here met, and the purpose which has drawn them together, I cannot help seeing that such a course would be what is popularly called "preaching to convert." I trust there would be no necessity for me or anyone else to go into the advantages of education, or into that upon which the future welfare of this country depends, namely, the amount of education. And I do not, in this instance, limit it to the lower classes—for every class in this great country must receive, and will receive it. But I think I speak to an assembly convinced of the general advantages of education; I think they will agree with me that one of the great evils with which we have now to struggle is the want of a general appreciation of the advantages of education; and it is this particular want which is felt, and which I think this meeting is very likely to help to counteract. There is much improvement in this respect. It is impossible to see the discussions in Parliament, the able discussions in the newspapers, and in important meetings of this character, without being impressed with the fact that it is a matter which deserves and receives the greatest consideration; and this is very apparent from the manner in which we all unite, without considerations of politics, class, or religion, or any other consideration, in order to carry out the work. I certainly was very much struck by the meeting held in London the other day—a meeting which I thought impossible to have an immediate or direct result, but from which I expect great advantages to flow. It was impossible not to perceive the great interest felt by one who stands nearest to the Crown, in this respect. Men of different creeds in religion and members of Parliament were there; and there was one point which gave me great pleasure, and my impression will be fully borne out by those present at that meeting. There were no speeches more cordially received in that assembly than those of the eminent men who, coming from this district, spoke with the authority which their own practical experience had given them, and with that knowledge which their own inquiries had enabled them to attain. I say this was one of the principal objects of that meeting, to increase the appreciation of the advantages of education amongst all classes of society; for when I consider the energies of this country, and the manner in which we succeed when we are determined to do so, I cannot but believe that in a district like this—so remarkable for its energies, its prosperity, and its perseverance—all classes are agreed that education is necessary, and that education we shall have. Now, there are several modes in which we can increase that appreciation of education. In the first place, I think it would be most injudicious in any real friends of education to urge on systems which would go counter to those who have the greatest interest in these matters—I mean the employers and the parents of the young. I think anything of that sort would be most injudicious; it is by the co-operation of all, by awakening the attention of the parents, that we must attain this object. What we are now going to do, I think, will have very much this effect. It is certain that any of those young men who may receive a mark of approbation this evening, will not only feel it is a recompense for the time they have applied for the purpose of instruction, but that this feeling will spread amongst their families, their parents, and their comrades. Everything that can be done to increase this feeling is of the greatest importance. I have just been at a dinner at which all of you were not present, where one gentleman, in a very eloquent speech, made this remark:—"Certain persons of the middle classes had complained that if this encouragement was to be given to the education of the lower classes, the middle classes would be pushed aside." The admirable answer which was given was one which will be obvious to you all—"That if the lower classes tread so closely upon the heels of the middle classes, the middle classes must make corresponding efforts to keep their own position; and if they do not keep it, it will be their own fault." (Hear, hear, and interruption arising from several workmen breaking some of the windows for the purpose of ventilation.) I believe this is only a practical illustration—(the noble Chairman was continuing to remark, when his voice was again rendered inaudible by the falling glass). I was going to say, resumed Lord Granville, that this seems to be a practical illustration of what it is our duty to try to effect this evening—to throw as much light as possible upon the subject, and to ventilate it thoroughly. I trust we shall go on in this course, but that our agitation may not be of so destructive a character. I said that the effect of the prizes to be given would be to give at once a notion of the value that education may confer. I know it is thought to be rather a low view of the subject that any young man should look upon the advantages of education as anything bearing a money value, but I am afraid in this practical world of ours that such considerations are not to be lost sight of, and it is very desirable that it should be known that it is, as I believe, an undoubted fact, that education does give a great money value to a man. My noble friend sitting by me (Lord Goderich), of whom I may be allowed to speak openly to-day (which I could not have done for the last six weeks, during which he has been sitting in judgment upon me), has presented a report to the House of Commons, in which he speaks with that authority which belongs to his personal character and his talents, augmented by the constituency which he has been lately elected to represent. One of the points to which the noble lord seems to have given great attention is the means by which education can be encouraged, and with that object he has exercised a pressure upon the government to encourage, by means of patronage, the education of the country. Now, it does happen, I believe, that I am the only person in either branch of the legislature who advocated a system of enlightened competition for government offices. But after two or three years' reflection upon it, I am not quite sure whether I was right on that subject. There are arguments for and against that principle; and it appears quite clear to me that a man at the head of a manufacturing establishment, or at the head of a landed estate, should not be expected to give up all responsibility as to the nomination of the persons to be employed by him:—I say I think it is a question whether it is not desirable to fix some responsibility on the heads of offices with regard to those who are chosen to discharge duties under their direction. But of this I am certain—that the compromise which has been made between the Members of Her Majesty's Government and my Noble Friend, is of the greatest possible use, and that it will act as a very great stimulus to the education of the country—the power of nomination being reserved, and many persons being admitted to compete for a vacant office. My own practical experience, ladies and gentlemen, amounts to this, that having acted upon that principle ever since I was last appointed to the office I now hold, I have found the result most excellent—both in the excellence of the clerks we have secured, and in the manner in which the business of the office has been performed by them. But there is one very important point which ought not to be lost sight of by any private individual who may wish to try the same means, namely, that the competition ought not, if possible, to be restricted to a very few persons. It is true that for a small office you ought not to have too many competitors, lest you create disappointment; but I think it is desirable, whenever practicable, to afford competition for more than one place at a time, because a competitive examination which is good, when applied to a large number, is not equally certain when applied to a very few. I make this remark, ladies and gentlemen, because I feel bound to make an observation which tends to illustrate the results of practice, rather than to dilate on general principles affecting the question under consideration. I am sure that almost every individual here present is able to assist in this work of education in a certain degree. It must be apparent to all, that the representatives of those great companies who require their servants to be able to read and write, must be in the districts which they traverse the great educators of the working classes. And those gentlemen who have promised, and who intend to act on that principle as much as they can, with regard to persons getting certificates from the Society of Arts, must exercise a most useful stimulus on education. Ladies and gentlemen, I cannot help congratulating this assembly upon the cordial manner in which the union of Mechanics' Institutes of this great county has co-operated with the Society of Arts in the work which they have undertaken. Without that cordial co-operation it must have been entirely abortive. And yet I think there is some use in having an extraneous body like the Society of Arts taking upon themselves those functions for which they possess a great advantage, having upon their council members of great zeal in the cause of education, and a great advantage in the examiners which they are able to appoint. And I think that the Society of Arts have one special advantage in making great experiments of this sort, in the very unofficial character, the character of private enterprise, which belongs to them. Of course it will be understood that I do not agree entirely in my friend Mr. Baines's principles of education. But we will not stay to discuss that question on this occasion. At present we are considering how education is to be promoted. I say it is an advantage that the Society of Arts, without official standing, without connection with Government, have taken upon themselves to make this great experiment—an experiment which I believe is succeeding by the aid of the cordial co-operation to which I have alluded. And I cannot help congratulating this great company on the march which has been made by this county of York. This morning I looked to a statistical account of the school in this country, believing that that matter is most important, even with regard to your Mechanics' Institutes. Those who feel an interest in Mechanics' Institutes must feel an interest in those schools which necessarily feed and supply our Mechanics' Institutes. Well, I find that the report to which I have alluded is most satisfactory. While Yorkshire contains less than one-tenth of Great Britain and Wales in extent, and not quite one-tenth of the population of England and Wales, I find that its accommodation for schools is one-eighth of the school accommodation of the whole country. And I find that in no other district is there the same amount of public money received for school purposes. Again, begging Mr. Baines's pardon, I beg to say that I am now quoting only to show the extent of private money which must be contributed in order to meet those grants. I think these are most promising statistics. It is a most gratifying example to us all, that there is no county in this country where the amount of school pence collected from the parents of the children is so great as in Yorkshire. I do think that these are very promising statistics, besides which there is one fact still more so—that in all these proportions there has been an advance in the very last year. I, therefore, congratulate you upon that fact. There is one great difficulty which all persons interested in the promotion of education must feel—the difficulty of keeping boys at school. At the same time, this is exactly one of those questions where we must not run counter to the feelings and interests of employers and parents. But we must omit no possible opportunity of filling up gaps, and take advantage of every breath of wind that can enable us to supply the deficiency. And this bears upon the question of evening schools, which are certainly not so general as they ought to be. It bears still more upon the question of Mechanics' Institutes, as long as you make these Mechanics' Institutes the real vehicle of conveying instruction to those who, taken from school, yet are not wishful to throw aside as useless the instruction which at a still earlier age they have been able to obtain for themselves. I think that those who take an interest in Mechanics' Institutes must feel how useful and how important their duty is in carrying on that work of education, which you may begin in your elementary schools, but which you can only carry on with effect if the instruction which has been given in those schools has been accurate, and if you are able to get constant attendance in evening schools from those who have left school. I really do not wish to trespass upon you any longer. I congratulate this meeting upon the step which they have taken this evening. I think that the very presence of so many persons here this evening is an encouragement to those who have had the practical toil and labour of this work. If I had been one of them I should feel it to the greatest possible extent. I think when you go home you will, to a greater degree than you have hitherto done, try to give every assistance in your power to the educational institutions around you. If I say this to Yorkshiremen, I say it still more emphatically to Yorkshirewomen. I am glad to learn that of the institutions established in the West Riding, one carried on with the greatest success is the evening classes for females as well as for males. I believe this is of great importance; it is of importance in every way. I never thought that it was possible to teach a boy a trade and work in a school; that must be better taught when he is paid by wages and superintended by an employer, whose interest it is to give him industrious habits. What I wish to be taught in schools to boys is—I will not say the knowledge of common things, but, to use the expression of one of our school inspectors, Mr. Norris, it is very important to give boys at school the knowledge of common principles, which afterwards they can apply to the work which they may have on their hands. I think that with regard to girls you may go still further. They will in the future exercise an influence not only upon their husbands, but a most important one on the future education of their children. It behoves you to take care that the women of this country are properly and entirely educated. I think you may go still further, and extend industrial training in their case beyond what would be perfectly judicious or desirable in regard to boys, particularly with regard to those useful occupations which teach women to be a source of wealth instead of a burden to their husbands and families, when they become wives and mothers. Therefore, I do trust that not only the men here present, but that the fairer portion of creation will assist us to the utmost of their power in making these institutions successful. I can only say that I am too grateful for the attention which you have ventured to pay to me in making my crude remarks. I had not the opportunity of preparing myself as a gentleman undertaking this post ought to have done, but I beg to thank you for your attention. To say that it is paid to a stranger acting in this capacity is evidence that you think the work which you have in hand is worthy. Intelligent and energetic as you may be in this great county, this is not a work to be confined to one district alone, but it is to be felt as a national work, in which every one bearing the name of an Englishman has an immediate and direct interest.

Lord Goderich, M.P., said—the occasion which had called them together was one full, as it seemed to him, of interest and importance. It had been truly said by the noble lord who had just sat down, that the work of popular education is one of the most important in which we of this generation can engage; and it appeared to him that this meeting was one of the most interesting and valuable that had taken place of late in regard to this question; for they were met for various purposes, all bearing, it was true, upon one object, but showing that that object was engaging the attention of English society in every class and in every direction. The Society of Arts, a London Society of long establishment and much celebrity, had come down into the North of England, and had especially selected Huddersfield as the centre of its operations, for the purpose of carrying out a scheme for which he, for one, entertained the greatest hopes with respect to the future spread of education in this country. That Society represented on that occasion the interest of the general public in this question, and nobly had its efforts been seconded by that local body with which they were all so well acquainted, and whose annual meeting they celebrated that evening—the Yorkshire Union of Mechanics' Institutes. There was another fact which was, as it seemed to him, yet more important. They had for their chairman a noble lord not only distinguished by his great talents and his devotion to the cause of popular education, but holding the position of a Cabinet Minister, representing, he thought he might venture to say, the interest which is felt by Her Majesty's Government in this question of education, and filling himself a post which answers, in some degree, to the position of Minister of Education. The noble lord had come to preside over that meeting, but although his Lordship was there to tell them of the interest which our rulers feel in this great subject, he had come, not to second or propose to them any scheme of Government assistance, but to aid them in their own voluntary efforts. He rejoiced greatly that they should have the honour of being presided over by his Lordship that evening, and yet he ventured to think that, high as this great honour and encouragement was, they might be able to show to Lord Granville some scenes on his visit to Huddersfield which would not be altogether without advantage to him; because he thought that those who ruled over this country should come down to the country, and, mingling with the people, learn what were their feelings. They were about to witness a scene most interesting in itself, the distribution of those prizes which lay now before him to those who, in the examinations of the Society of Arts, had won them by their industry and their intelligence, and they would see, if he mistook not, that those who had carried off some of the most important and valuable prizes, had been the young men whose days had been spent in the mills and warehouses of this district, who had devoted their evenings to study, and to study that had borne good fruit. The resolution which had been placed in his hands urged the importance of a widespread and general adoption of a system of classes in connection with Mechanics' Institutions. He need not say much there to impress the members of the Huddersfield Mechanics' Institute with the advantages of that system; it was already the corner-stone of the Institution. It was by means of those classes that the Huddersfield Mechanics' Institute had attained the high position it now held, which had entitled it most justly to be held up as a model to other similar Institutions. The reading-room should be subsidiary to the evening class, where the working man should be able to go to perfect his studies; but it was absolutely necessary, if his knowledge was to be sound and of value, that he should be guided by those who had preceded him in the path. So it was with lectures. He had heard a most eminent lecturer, Mr. Geo. Dawson, say that the business of the lecturer was not to attempt the impossible task of laying before his audience, in the short space of one or two lectures, complete information, but to present his subject in an attractive form so as to induce his hearers to study it afterwards. A lecture which attempted to do more than that would fail of its purpose. If these efforts of the Society of Arts,—efforts which he entirely agreed with the Noble Chairman in thinking of the greatest value and promise for the future,—were to be continued, it was necessary that there should be a great extension of the system of evening classes in Mechanics' Institutes. Why was it that Huddersfield came so well out of this examination? He did not suppose that the inhabitants of this district, though he had every reason to know their ability, their love of knowledge, and their intelligence, possessed more of these qualities than their neighbours; but they possessed this advantage, that they had long had among them a Mechanics' Institution of which a distinguished feature had been its classes, and that was a reason why they had been so successful at these examinations. It had been one of the especial purposes of the Yorkshire Union, for a long time, to impress upon those with whom it came in contact, the importance of this portion of the benefits of Mechanics' Institutes. Often had he heard that opinion expressed by the able president of that Union, his friend, Mr. Baines; and he was very glad that, by the steps which had been taken by the Society of Arts, this question had been brought forward so prominently that it could be no longer doubted that the impression as to the utility of these classes was not confined to a few, but shared by those who were most able to speak of the best means of promoting the education of the people. He trusted that in Huddersfield yet greater facilities would shortly be afforded for carrying out that system. They knew that efforts were being made for the purpose of erecting a new Mechanics' Institute. In conclusion, Lord Goderich proposed the following resolution:—"That the evening classes of Mechanics' Institutes, as assisting to supply the want of elementary instruction, are entitled to the continued and increased support of all who are desirous of promoting the mental and moral improvement of the rising generation."

Mr. R. Monckton, Milnes, M.P., seconded the resolution, and said, he would go a little beyond some of his Lordship's propositions, and say, that in the establishment, maintenance, and working of evening classes, they had the very first and most important feature of Mechanics' Institutions. Evening classes, indeed, might be regarded as the provincial colleges of the people. These Institutions were for the education of the working classes—meaning thereby those who had at an early age to abandon their school for the purpose of earning a living by honest industry. The only time at the disposal of those persons was after the day's work was done, and their education was of the utmost importance. Looking at the progress of education within fifty years, great as had been their social, political, and material development, which had sent the English blood and language over the entire globe, yet there was no development more surprising than that which met its consummation that evening, where they found employers of masses of labour coming together to promote the education of those by whose labour their wealth was acquired, and by whose industry the prosperity of the country was to be sustained. They could all remember the fictions of some years ago, where there were two young men—one somewhat dull and uneducated but industrious; the other studious and dreamy. The *dénouement* was, that the industrious young man became an alderman, at least, while he with education was in all probability hanged. But employers of labour and others had now come to the knowledge that the good workman and the assiduous learner were not necessarily separated. They had seen that many of those discoveries which had tended most to the material prosperity of the country had come from those who were employed in daily labour. The day had gone by when an employer of labour would prefer the uneducated to the educated workman. They were all prepared to combine with the Earl Granville in starting from the point at present attained, and advancing the education of the working-classes as far as they could. They had there not only learners but workers also. His Noble Friend in the chair was a workman as well as a learner; and the owner of almost the whole of Huddersfield was now behind his desk in the War-Office, working almost as hard as any clerk in any of the counting-houses of Huddersfield. These were the things which made Englishmen proud—these were the conditions which showed that, after all, great as was the separation of classes in this country, there were great moral sympathies and great communion of mental interests, which united them together.

J. W. Childers, Esq., supported the resolution.

The Chairman then proceeded to the distribution of the prizes, the Secretary of the Society of Arts first reading the reports of the examiners, which were given in last week's *Journal*, p. 520. For a list of the prizes and certificates, see last week's *Journal*, p. 523.

Mr. Commissioner Hill, Recorder of Birmingham, moved the following resolution:—"That while the extension of instruction in the most useful branches of science and literature has been materially aided by the various Mechanics' Institutes in the county, their general efficiency has been assisted to a considerable extent by the Yorkshire Union, which, by the services of a paid agent, the publication of an annual report, and constant attention to the interests of the several Institutes comprised in the Union, has entitled itself to the support of all who desire to promote the mental and moral welfare of the community." He said this resolution had been propounded by the leaders of those valuable institutions, and their authority appeared to him to be so high as to require no further proof to entitle it to their favourable acceptance. All, therefore, that he would, at that hour, say upon the subject was this—that he was quite certain, notwithstanding some speeches which he had read in newspapers lately, giving, as it appeared to him, a most unjustifiable magnification (if they would allow him to coin a word) of Latin and Greek—he was certain, when he found such results produced, such acquirements made, by a class who had not the means to give up four or five or six years of life to the acquirement, to any great extent, of Latin and Greek, they would say that the error which prevailed in the time of the great satirist Butler, in the reign of Charles II. (notwithstanding the speeches to which he had referred) had passed away. The satirist complained that in his day—

> "He that can but so express
> His want of sense in ancient languages,
> Shall pass for learneder than one
> Who speaks in strongest reason in his own."

These young men had laid up a stock of ideas, and they had learned to express those ideas in their own language. They cultivated that which to an Englishman must always be a language of the highest importance and the greatest value. Others seemed to him to value languages because they were dead—he would call upon them to value English because it was living—because it was the language which we must use amongst our own countrymen, if we wish to address either their intellects or their hearts, if we wish to influence them, if we wish to move them, if we wish to instruct them in any way, either for their own interests or for ours. Other instruments of knowledge must be used now and then. He had nothing to say against them. God forbid. But the English language they used every day, many of them every hour, and some of them every minute of their lives. Surely, then, Institutions like this, which call attention to the cultivation of that tongue, were of infinite importance. If the young men whom he had seen to-day, and whose triumph he had witnessed with the deepest sympathy, though he never before heard their names—if they would take advice from one whose name probably they had never heard before—an old man who had the strongest sympathy in their favour—it would be that to their other studies they would add this, a most careful cultivation of their mother language. Let them not, even in conversation, let them not, even in the familiar intercourse of the fireside, permit themselves to use it carelessly and ungrammatically. Let them increase their knowledge of the words of our language by careful and extensive reading. This he found many of them had already done. And let them remember that no language could be said to be really acquired unless the scholar was able to write accurately in that language. Now, these were very prosaic observations, but they might—coming from one who had had the experience of a life now of no short duration—be of some use, and they might be accepted and remembered. He thanked them for the hospitable reception they had given to a stranger. This was the first time he ever entered their town—he should be very sorry to believe it would be the last.

Mr. Akroyd, M.P., in seconding the resolution, said, he would not, at that late hour, trespass at any great length on their attention. The ladies had already borne their share in the proceedings of the day at the bazaar, and he was glad to learn that they had advanced so far in the object they had in view, and had obtained so much in the important step of erecting a new building for the Huddersfield Institution. As to the advantages of Mechanics' Institutions, they were admitted on all sides, nor need he dwell on the advantages which had been derived from the Yorkshire Union, through whose agency had been brought to bear on that occasion the competition of the Society of Arts examination. That competition could not but have the best results, for it was the chief impulse to success. He was glad to learn that the Huddersfield Institution, which had always stood as one of the first in the kingdom, had stood well in the examination. He then alluded to the zealous efforts of Mr. Baines in the cause of education, and to the excellent report presented by Mr. Hole at the morning conference, after which he spoke of the danger, in Mechanics' Institutions, of young men taking a bird's-eye view of subjects, instead of investigating them thoroughly; and concluded by again reverting to the discussion at the conference of delegates, especially with reference to the domestic education of women, and by urging the importance of such education as affecting the present comfort and the future welfare of the working classes.

Mr. J. P. B. Westhead, M.P., supported the resolution, and said he sincerely sympathized with the objects of the Yorkshire Union of Mechanics' Institutes. They owed a deep debt of gratitude to their noble chairman for coming down to perform the duty which he had performed that evening, a duty which, some thirty years ago, would have been thought absolutely impossible by any nobleman in the land. They were also deeply indebted to the nobleman who represented the West Riding, for his deep interest in the welfare of the working classes of this country. They might well feel proud at seeing members of their aristocratic families bending their minds and giving their attention so earnestly and immediately to what concerned the well-being of the working classes; and he trusted that the Yorkshire Union of Mechanics' Institutes would go on prospering and to prosper. He reminded the meeting that nearly all those great improvements which had benefited the country had originated in the minds of self-taught men, recalling to their remembrance the names of Arkwright, Kaye, Crompton, Brindley, and George Stephenson, and suggested that no pleasure could be greater than that arising from furnishing the means of bringing out, in the minds of such men, those great conceptions which God had implanted there. The late Lord Ellesmere, when looking at some machinery in one of the mills at Manchester, and witnessing its wonderful mechanism, and adaptation to the purposes for which it was used, said that he had examined it till he wondered whether this machinery was not more intelligent than himself. And surely those who studied in their Institutions the principles of science, would naturally have their thoughts directed from the handiwork of man to the handiwork of Him who is the Creator of all things.

The resolution was carried unanimously; and

The Hon. and Very Rev. the Dean of Ripon proposed the next resolution, as follows:—"That believing the examinations of the Society of Arts to be capable of affording a practical stimulus to the operations of Mechanics' Institutes by promoting emulation amongst the students of adult classes, this meeting desires to express its thanks to the Society of Arts, and to request that the good work may be continued by an examination being held next year at some convenient town in the county of York." He said he had so frequently expressed himself upon subjects relating to these institutions that he should stand excused, he was sure, if he refrained from troubling them with any lengthened observations that evening. The resolution was a most gracious one, and contained faith, thanksgiving, and prayer. Formerly they barely ventured to hope in their resolutions, but now they had got to believing; they had reached the point of faith. Having had proof positive that all their anticipations had been founded on safe and solid principles, they proceeded to thanksgiving, and to an acknowledgment of their gratitude for the extraordinary measure of assistance which they had received from the Society of Arts. From that they arrived at the prayer that the Society of Arts would do next year what they had done this. That Society had already conceded the petition, so that their prayer was answered even before it was uttered. One other remark, and he would release them. He had received a printed document from Manchester, which condemned and warned them against "the great sin of the present day, the idolatry of unsanctified intellect." Why, that riding school was an idol temple! The Art Treasures Exhibition of Manchester was a temple of idols, and the Society of Arts was worse than the temple of Juggernaut! Well, he hoped that God would in his mercy overrule their efforts in the education of the youth of this country so long as that education tended to make them ungodly; but may God bless their efforts to give to the rising generation that education which was the best handmaid of religion.

Sir John Richardson seconded the resolution, and expressed his warm sympathy with those who had received prizes and certificates, and said that he had no doubt those prizes and certificates, as well as the proceedings of that evening, would give a most beneficial impulse to education, by stimulating future efforts. He then referred to the system of education prevailing in the State of Massachusetts, explaining its provisions, and concluded by reminding his hearers that the world was not standing still, and that if they did not move forward in the work of education they would be left behind by their younger brethren who possessed greater energy and resolution.

Mr. Frank Crossley, M.P., supported the third resolution.

Viscount Goderich then took the chair, when

Mr. John Brook moved, and Mr. G. S. Tolson seconded a resolution conveying the best thanks of the meeting to the Right Hon. Earl Granville, K.G., for the great ability and courtesy with which he had performed the duties of chairman, and also expressing appreciation by the meeting of the high honour which his lordship had conferred upon the Yorkshire Union of Mechanics' Institutes by his presence on this occasion. The motion was adopted amidst great cheering, the audience all rising from their seats.

Lord Granville made a brief reply, and the proceedings then terminated.

MORAL AND SOCIAL SCIENCES.

The following letter has been laid before the Council, and as the tenor of it is in accordance with the object and proceedings of this Society, the matter has been referred to a committee to consider and report thereon:—

Sir,—I am desirous of drawing the attention of the Council of your Society to a meeting which it is intended to hold during the approaching month of October, in the town of Birmingham.

It has long been felt by many persons who are interested in the various questions bearing on the moral and social improvement of the people, that this range of topics might be well embraced in one general organization, in the same way as the subjects of physical science have been grouped together by the British Association.

The improvement of our laws, education, whether intellectual or industrial, the reformation of criminals, and the prevention of crime, the public health of our towns, and other topics of a similar nature, are all more or less connected together, and obtain support from much the same class of thinkers. Considered together they would probably be found to elucidate each other, and the mutual communication of knowledge might remove many of the present obstacles to improvement.

In order to illustrate the nature of the meeting, I may mention that the following sections are already designed:

A section on Jurisprudence and Law Amendment, which will be supported by the Law Amendment Society.

A section on Reformatory and Industrial Schools, to be supported by the National Reformatory Union.

A section on Education.

A section on Public Health.

A section on Political Economy, Finance Statistics, &c.

Lord Brougham will preside over the meeting, and will deliver an inaugural address on the first day.

I believe that his lordship will be most powerfully supported, and that the various sections will be well supplied with papers.

Should the meeting be as successful as is anticipated, it is thought probable that a permanent association for the advancement of moral and social science, (under whatever name may be fixed,) may be organised, hold annual meetings, and perhaps lead to a closer union in London of the various societies which aim at the accomplishment of the different objects embraced by the projected association.

This, however, is for the future; the present object being to obtain as influential and useful a meeting as possible; and it is hoped that your Society will assist by recognizing the utility of the idea, dispensing information on the subject among its members, and giving to one or more sections its powerful support.

I am, &c.

G. W. HASTINGS.

3, Waterloo-place, Pall Mall, S.W.,
July 22, 1857.

NEW PISTON WATER METER.

The following is a digest of a paper "On Recent Improvements in Water Meters," read by Mr. Benjamin Fothergill, C.E., at the meeting of the Institution of Mechanical Engineers, held in Manchester, June 26, 1857, Joseph Whitworth, Esq., C.E., in the chair:—

"The paper pointed out the necessity for an efficient measuring apparatus. The average price of gas might be taken at 4s. 6d. per thousand cubic feet; but the price of water, at 1s. per thousand gallons, was 6s. 3d. per thousand cubic feet. If it was therefore necessary to have meters for gas, it was equally necessary to have meters for water, which was dearer. Meters might be divided into low and high pressure. The best low-pressure meters were those by Parkinson, of London, but they were in many respects unsatisfactory. The attention of engineers had been directed to obtain a correct and durable high-pressure meter, capable of registering the quantity of water delivered, without lessening its pressure or velocity. High-pressure meters had been classed as inferential and positive meters. The well-known inherent defect in all inferential meters in allowing small quantities of water to pass without registration, was an objection to such machines which no superiority of workmanship could remove. Taylor and Siemen's, and Adamson's were the best of this class, yet they were not free from these defects. Of positive meters, or those measured by capacity, many had recently been constructed on the principle of the diaphragm; but, in consequence of the impossibility of finding any flexible material sufficiently durable, they had not been brought into general use. The nearest approach to practical efficiency amongst those using flexible material, was Chadwick's rotary meter; but although they registered correctly, they had not been found satisfactory in regard to durability. Several, by other makers, were liable to the objection of the unequal extension of the flexible material. Amongst the piston meters were Kennedy's, Worthington's, Jopling's, and Chadwick and Frost's. In Kennedy's meter, the racked piston rod, and the use of Woodcock's patent rolling packing, were the distinguishing features. This meter was the best which had hitherto been brought into use; but there was some liability to stoppage, by the sticking of the tumbling-lever, when the valve was only partially closed, the water being then allowed to pass unregistered. There was also necessity for lubrication and packing, involving inspection. In Chadwick and Frost's piston meter, the latest and most important improvements had been effected, and the difficulties connected with previous attempts appeared to have been satisfactorily solved by the invention or application of a compound fluid motive valve, actuated by the pressure of the water, but not concerned in the measurement. The meter, consisting of a cylinder and piston, with Woodcock's rolling packing, and other arrangements, was explained by the aid of diagrams. It was comparatively small in size, required no lubrication, had no tumbling weights, worked smoothly, allowed no leakage, and from an examination which he had made, he found it to register with a nearer approach to absolute correctness than any other. There was one at work in the adjoining room, and a larger one, constructed to measure 8,000 gallons per hour, might be seen at work in the Water Works' Yard, Town-hall, Salford, on applying to Mr. Chadwick. Mr. Fothergill then remarked that he believed this to be the best meter at present produced, and if any one could invent a better, it would afford him pleasure to see it. The President inquired whether Mr. Fothergill had found any difference in drawing large and small quantities from it—An answer was given in the negative. In answer to a question by Mr. Forsyth, as to how long it had been in operation, it was replied about three months. Mr. Chadwick remarked that it had only been patented a few months, and was brought forward earlier than was intended. After giving seven years' attention to the subject of water meters, he was acquainted with the difficulties, and knew that a large amount of durability was requisite in every part. There was a great want of a perfect meter, and he thought this one would prove to be free from some of the defects which had been referred to, as well as economical in construction.

CULTIVATION OF TRUFFLES.

A pamphlet has lately been published in France upon this subject, by M. Martin Ravel, a well-known truffle merchant, which contains so very original and curious a theory that it has been thought an outline of it would not prove uninteresting. M. Ravel has been remarkably successful in the cultivation of truffles, although it must be confessed that the views propounded in his work are so contrary to all the past experience of naturalists, that they will require very searching investigation before being at all generally received. M. Ravel begins by saying that up to this time naturalists have believed that the truffle was an ordinary vegetable product, and that it had, like other plants, its characteristic life and vegetation; but his opinion is that the truffle is merely produced accidentally in the vegetation of the oak by the prick of a fly, to which he gives the name of "truffigène." It is admitted in natural history that certain flies prick certain plants in order to produce excrescences which protect their nest of eggs, and these excrescences vary in their character according to the different plants upon which they are produced.

The prick made in the branches of the oak tree by the gall-fly produces the gall-nut, which contains gallic acid; a similar prick made by the "truffigène," in the fibrous roots of this tree, produces the truffle. The truffle may be considered as a species of gall, produced, it is true, by a different insect, and containing different elements, but the gall and the truffle are both the work of an insect desirous of providing a shelter for its eggs, and preparing food for the larvæ.

With regard to the truffle, the operation proceeds in the following manner:—The "truffigène" fly, that may be seen in winter constantly flying about the truffle grounds, and round the oaks which produce the truffles, penetrates into the ground, reaches the fibrous roots, and pricks them at their extremity to deposit its eggs; the prick causes a drop of milky fluid to ooze out, containing an azotized principle; this slowly enlarges by the addition of the azote, which it continues to receive from the roots of the oak, and it also draws it from the air, if any fissures in the ground enable the air to reach it. If several drops of this milky fluid touch each other in growing, they unite and form those large truffles of irregular and fantastic forms, whose size varies according to the number of truffles thus joined.

The truffle being formed, the roots, wounded by the "truffigène," die, and the truffle, thus abandoned to itself, grows and expands by means of the nourishment afforded both by the earth and the air. M. Ravel states that all who have carefully examined the truffle have been unable to discover in it any germ or radicle, and he brings this forward as a further proof that it is not a vegetable product.

It is only some varieties of the oak which produce truffles, and it is said to be very difficult to distinguish those possessing this peculiarity. One of the surest signs is the total absence of vegetation over the entire space of ground covered by the truffle oak, and when the truffles begin to be produced, in the manner just described, every trace of grass disappears.

A barren argillaceous soil is believed to be the best for their cultivation, and M. Ravel recommends acorns to be sown in it, after a plan which he indicates.

A hole about three inches deep is made in the ground with a conical shaped hammer; the acorn is placed in this hole, and covered up with earth, which is beaten down firmly with the broad side of the hammer; by this means the ground round it is hardened, so that the rats cannot attack the acorn. The distance to be left between the rows depends on the intention of the cultivator. If they are sown with the idea of being transplanted, it is sufficient to place the acorns in a line at the distance of 6 centimetres from each other, with 80 centimetres between each line. In this way there will be sufficient space for the growth of the plants until they are fit to be transplanted. If, on the other hand, it is not intended to transplant them, a distance of 15 centimetres should be left between each, with 3 metres between the rows.

In order that the "truffigène" fly may flourish and produce abundance of truffles, it is necessary that the truffle grounds should not be deprived of sun. As the young oaks grow, therefore, the plantation must be gradually thinned; the consequence is that the truffle ground is continually decreasing, as well as the quantity of truffles produced, for as the "truffigène" fly only attacks the extremities of the roots, it is only at the circumference of the circle occupied by the roots of the tree that the truffles are formed. M. Ravel concludes by expressing a hope that his method of culture will be extensively adopted, as he is of opinion that the production would thus be largely increased.

Home Correspondence.

EXAMINATIONS.

Sir,—At the Annual Conference, on the 24th June, Colonel Sykes stated that, "Another matter to be considered was, that the Examinations had been conducted by gentlemen, some of them of the highest distinction in literature and science, whose time was most valuable; and, as the number of candidates increased, it could not be expected that those gentlemen could continue to give their gratuitous services on such occasions." Now, sir, allow me to suggest, that it would save much of the time and labour of the Board of Examiners were they simply to adhere to the rule, stated by the Rev. Dr. Booth to have been laid down by the Board, and confirmed by the Council of the Society, viz.: "That no person who is at school can be included in the examinations."

On referring to the list of certificates, I find that, out of two hundred and twenty-two certificates that were awarded, eighty-two were given to persons actually at school. The numbers in each class I subjoin. The examiners have, therefore, been devoting one-third of their time to persons who should not have been included at all, and for whom Examinations have been instituted by the College of Preceptors. And it must be remembered that, in most cases, these examinations are not undergone by the boys on their own account, but that the principal may be able to point out that so many of his pupils have obtained certificates from the Society of Arts. Of course, as the Chairman remarked, it would hardly be convenient "to go back to the previous life of every candidate, and inquire how he gained his information;" at the same time, there is no reason that the time of the examiners should be taken up, and the benefits of the examinations reaped by those who *avowedly* do not belong to the class for which they were instituted.

To the candidates themselves it matters little how many persons are examined, as far as the certificates are concerned, as they are absolute, not relative; but the case is different with regard to the prizes, which are, to a certain extent, competitive, and six out of twenty of which have been gained by persons at school. These prizes were established to afford encouragement to *pupils of institute classes*—and, if the Society continue to *examine* pupils of *schools*, these latter should, in common fairness, be excluded from competing for the *prizes*. It must be remembered that a school-boy can give up the whole of his time to the preparing for the examinations, while those who are engaged in business have but a few spare hours for study. I am, &c.,

PAUL BLACKMORE.

Wandsworth Literary and Scientific Institution,
July 14th, 1857.

Class.	Total No.	Gained by pupils of schools.
Arithmetic	40	12
Book-keeping	11	3
Algebra	16	7
Geometry	22	10
Mensuration	19	9
Trigonometry	13	8
Conic Sections	9	6
Statics, &c.	3	—
Practical Mechanics	1	—
Hydrostatics, &c.	4	1
Electricity	4	2
Heat	4	2
Chemistry	10	—
Botany	1	—
Agriculture	2	—
Political Economy	5	—
English History	5	1
Geography	12	4
English Literature	8	1
Roman History and Latin	9	6
French	17	8
German	4	1
Freehand Drawing	1	—
Mechanical do.	2	1
	222	82

MECHANICS' INSTITUTIONS.

Sir,—In my last letter I commented on the advantage and necessity of classes founded on the principle of mutual instruction as well as those of an elementary character, but it cannot be too forcibly impressed upon the attention of managers, that in order to insure success they must consult the circumstances of their respective localities, not only with reference to the nature of the benefits offered, but also as to the means of obtaining them. In places where a large portion of the population is in receipt of weekly wages it is advisable to receive weekly subscriptions, with the twofold advantage of enabling the members to arrange their payments according to their receipts, and also of obtaining a greater amount of subscription, the small payment weekly or fortnightly being less felt than the larger amount quarterly. In few cases should the weekly rates be less than 3d. for males and 2d. for females, and for this they should be entitled to all the advantages of the Institute, except, perhaps, the exclusion of females from the reading-room.

For members in another condition of life, such as tradesmen, clerks, and others, the rates should not be less than 2s. 6d. quarterly. A plan has been pursued with great success in some Institutes, of giving the privilege to larger subscribers to nominate a pupil to classes on the payment of 1d. a week for every guinea payed annually by the subscriber. It often enables a large employer to reward a deserving boy, and the privilege is valued by the subscriber, who thus enjoys a kind of patronage of the recipient of the advantage, and also of the Institute in the augmentation of its funds.

With reference to the selection of teachers, in most small towns and villages there are national schoolmasters, who would gladly avail themselves of the small addition to their income which the teaching of evening classes would obtain for them, and they might be materially assisted by such gratuitous aid as the committee of the Institute could supply. It is, however, in no case advisable to rely upon gratuitous teachers, as in elementary classes especially it is of primary consequence to maintain punctuality, and, however zealous gratuitous teachers may be, it cannot be expected that they will forego every other call upon their time to attend to a self-imposed duty.

Another point deserving of attentive consideration is the proper supervision of class instruction, so that it shall become of practical benefit to the members. It is a great mistake to treat pupils of classes as independent members. Their previous acquirements should be examined into, and they should then be placed in such classes as will be most likely to carry them onward in mental improvement. There are many young men ignorant of almost the first steps to knowledge, scarcely able to read or write, who yet have a strong desire to enter at once into the mysteries of mathematics, and feeling a great difficulty in signing their names, are ambitious of shining in conic sections. Such ambition may be creditable to the pupils, but its gratification is not judicious on the part of the teachers. Where the number of members is large the classes for arithmetic should be divided into gradations, and the advance from one division to a higher one should be made the reward of diligence and application. By this means would be required a more systematic teaching than generally prevails, and it would soon be valued by those who at first might feel the irksomeness of the restraint.

The time occupied in class instruction should not exceed two hours, and writing and arithmetic might be taught in the same room on the same evening, by occupying the first hour with writing, and the second with arithmetic, the change being made with all the pupils at once. As the pupils become more proficient they might commence in algebra, or such other studies as their own inclinations will direct them to, and gradually classes might be formed of pupils trained in the Institute with especial reference to the examinations of the Society of Arts. It is, however, advisable that in every Mechanics' Institute there should be a periodical examination of class-pupils, and small prizes awarded for proficiency. It would operate as a stimulus to application, besides assisting to promote a better attendance, as the benefits to be derived from the Institute would become more known to the inhabitants of the locality. To accomplish this end, however, would require a vigilant superintendence on the part of the committee, and a constant reliance on the practicability of that success which cannot be obtained without industry and perseverance. EPHRA.

Proceedings of Institutions.

Dorchester.—On Tuesday evening, the 14th July, the Rev. H. Moule delivered a lecture on "The Connection of Mutual Improvement Societies with the Society of Arts," at the Town-hall, before the members and friends of the Dorchester Working Men's Mutual Improvement Society. After a few introductory observations, the rev. gentleman remarked that the importance of the connection of such a society as this with the Society of Arts, would be made plainer perhaps if he should dwell a little on the objects with which men should enter it or support it. Some of its supporters seemed to him to have very limited views on this subject. It was very important to do so, they said, in order that young men might be kept from the public house. So it was. As a result it was very important. Still, this was but a limited view of the improvement of young men, and the effect of such a limited view was evil. This object being of a negative character, so was the proposed mode of attaining it. For instance, he had heard one such supporter of their society strongly recommend the light reading of the day, another recommend a draught board, another a backgammon board. Now, to say nothing at present of the evil tendency of some of these modes of spending time, it surely was trifling with the great subject of mutual improvement. The true light in which to regard this subject was that of recovering lost opportunities—making up for lost time. Hitherto the time allotted for the education of the children of the working man was too short, and that time by many of them had been wasted. Some, on reaching the age of manhood could read but little, or indifferently; few perhaps could write well; fewer still could spell correctly; fewer still again could express themselves properly, or reason justly. Now, surely, for a person in either of these conditions to be spelling out a novel or a weekly tale, or to spend his evening in a game of draughts or backgammon, under the name of a Mutual Improvement Society, would be to repeat the mistake of his boyhood and greatly to delude himself. But more than this, every day seemed to make it more necessary in the business of life, that men should learn to observe correctly, to reason correctly, to form principles, and to carry them into action. Now, with such objects before him, what a pity—should he not even in this light say, what a sin?—to waste the little time a mechanic could command, either in fictitious reading or in mere pastime, or in talk often empty, and discussion often unprofitable, from the very want of real information and of fixed principles in some, if not most, of those engaged in it. But some would say, it was very hard, after a long day of hard work, to sit down again on the school bench and work at reading, writing, and arithmetic. So it would be unless they had a definite and proper object in view. What, then, should that object be? He would try to tell them. Not learning for learning's sake, nor for mere gratification. The object should be simply that professed by their society—improvement; but improvement that should not rest in selfish enjoyment—improvement that should benefit their condition, that should benefit the condition of their class, that should either render the station of life in which God had placed them more pleasant, or give them an opportunity of rising. And this object, to be aimed at in dependence on God in a course of diligent studious effort, he delighted to hold out to the working man and his children. It was just as legitimate an object for him as for those above him, and it was therefore delightful to him (Mr. Moule) that such an influential body as that of the Society of Arts had now for two years entered on that course of examination which he would now bring before them, as being in exact accordance with this view—as encouraging the workman to study, and to improve himself with the prospect of improving his condition. Mr. Moule then proceeded to give details of the Society of Arts and its examinations, which he drew principally from two lectures on "How to Learn, and What to Learn," by the Rev. Dr. Booth. In according a vote of thanks to Mr. Moule, two of the members promised that the proposal to form a connection with the Society of Arts and establish classes should receive full consideration.

Newport.—An interesting ceremony recently took place here in connection with the Iron and Coal Masters' Association for the diffusion of education, when the bishop of the diocese distributed money prizes to the amount of between £80 and £90, and varying from £2 downwards, together with a number of church services, bibles and prayer-books, to more than 100 out of 219 children, who had been examined by the Rev. H. M. Bellairs and J. Bowstead, Esq., two of her Majesty's inspectors of schools, and who were selected from various schools in the mining districts of the county. The Iron and Coal Masters' Association is composed of the iron manufacturers and colliery proprietors, who are actuated by a praiseworthy desire to induce parents to keep their children at school longer than at present is usual, owing to the early age at which children become a source of profit to their families. The scheme upon which the

Monmouthshire Association is based has been received with much favour in Staffordshire, Cheshire, Birmingham, and elsewhere. In Monmouthshire, although established less than a twelvemonth, the association has met with large support and sympathy from all classes, and the subscriptions have been very liberal. The course of examination comprised the four simple and compound rules of arithmetic, reading, writing, grammar, geography, and needlework, to which were added exercises in the Scripture and Catechism. The ages of the children ranged from eight to fourteen. The qualifications which entitle a child of either sex to compete are, the production of certificate from a teacher that a school has been attended 176 days during the preceding year—that the candidate is of good character, and his parents employed in the works of a member of the association. The expenses of the children and masters attending from their several districts were paid by the association.

To Correspondents.

Erratum.—In the last number of the *Journal*, page 524, col. 2, line 5, for "Huddersfield Mechanics' Institution, Thomas Walker (E)," read "Otley and Shipley Mechanics' Institution, Thomas Walker (E)."

PARLIAMENTARY REPORTS.

SESSIONAL PRINTED PAPERS.

Par. No.

Delivered on July 23rd.

38 (7) Civil Services Estimates—Class 7.
155. Hong Kong—Papers.
173. Hop Grounds—Return.
178. Spirits (Ireland)—Returns.
179. Ordnance Survey (Durham and Northumberland)—Return.
138. Bills—Illicit Distillation (Ireland) (amended).
139. ——— Representative Peers (Ireland).
141. ——— Boundaries of Burghs (Scotland).
142. ——— Copyright Acts Consolidation.
143. ——— County Court Judges (Falconer and Yates's Salaries).
India (Mutinies in the East Indies)—Papers.

Delivered on July 24th.

166. East India (Bengal Military Fund)—Correspondence.
179 (1). Ordnance Survey (Cumberland and Westmoreland)—Return.
190. Vessels and Tonnage, &c.—Return.
194. East India (European Troops)—Correspondence.
200. Militia Estimates—Report from Committee.
202. Public Debt—Account.
140. Bills—New Zealand Government Act Amendment.
145. ——— Sale of Waste Lands (New Zealand).
148. ——— Constables (Detached parts of Counties).

Delivered on July 25th and 27th.

49 (2). Trade and Navigation Accounts (30th June, 1857).
135. East India (Territorial Revenues and Disbursements)—Accounts.
38. Civil Services Estimates—General Abstract.
161. Oyster Fisheries (British Islands and France)—Return.
165. Barracks, &c.—Return.
180. Coinage—Account.
210. Ordnance Survey (Scotland)—Amended Estimate.
149. Bills—New Zealand Loan Guarantee.
144. ——— Oaths Validity Act Amendment.
147. ——— Burial Act Amendment (as amended in Committee and on re-commitment).
150. ——— Election Petitions (amended).

Delivered on July 28th.

145. Fiuance Accounts—Classes 1 to 8.
152. New Government Offices—Copy of a Letter.
192. Ecclesiastical Corporations Bill and Ecclesiastical Commission, &c., Bill—Report from Committee.
209. East India (Railways)—Return.
40. Civil Contingencies—Corrected pages.
146. Bill—Agricultural Statistics.
India (Mutinies in the East Indies)—Appendix to Papers.

Delivered on July 29th.

67 (1). Dover Mail Packet Contract—Amended Return.
188. Army Promotions—Return.
189. Army Medical Expenses (Militia)—Returns.
206. Sligo Borough Election (Mr. Somers' Petition)—Report from Committee.
303. Breakwaters, &c.—Return.
151. Bills—Offences against the Person.
152. ——— Malicious Injuries to Property.
153. ——— Forgery.
154. ——— Coinage Offences.
155. ——— Accessories and Abettors.
156. ——— Larceny, &c.
157. ——— Libel.
158. ——— Railways (Ireland).
160. ——— Crowded Dwellings Prevention.
161. ——— Town Bye Laws Revision.

Delivered on July 30th.

170. Oxford City Election Petition—Minutes of Evidence.
159. Bills—Insurance Companies (amended).
162. ——— Deer, Game and Rabbits.
163. ——— Joint Stock Companies (Lords amendments).
166. ——— General Board of Health Continuance.
165. ——— Wills, &c., of British Subjects Abroad (amended);

Delivered on July 31st.

106 (1). Marriages (England and Wales)—Return.
138. Oxford University—Ordinances.
139. Cambridge University—Two Statutes.
204. Education (Ireland)—Annual Report.
219. Indian Army—Return.
169. Pontefract Election Petition—Minutes of Evidence.
164. Bills—Clerks of Petty Sessions (Ireland) (amended).
167. ——— Smoke Nuisance (Scotland) Abatement (amended).

Delivered on August 1st and 3rd.

195. Falkirk Election Petition—Minutes of Evidence.
213. Clock Tower (New Houses of Parliament)—Returns of the amount in weight of Gold Leaf used.
197. Income Tax, &c., London—Return.
201. Excise and Customs—Return.
168. Bills—Police (Scotland) (amended).
169. ——— Prisoners Removal.
172. ——— Burial Grounds (Scotland) Act (1855) Amendment.

PATENT LAW AMENDMENT ACT.

APPLICATIONS FOR PATENTS AND PROTECTION ALLOWED.

[*From Gazette, July* 31.]

Dated 24th June, 1857.

1758. Hamilton Henry Fulton, and Thomas Bodley Ettey, 8, Great Queen-street, Westminster—Increasing the traction and bearing surface of carriage wheels.

Dated 25th June, 1857.

1784. Joseph Arthington and Henry Smith, Huddersfield—Improvements for the better illumination of the Davy lamp.

Dated 2nd July, 1857.

1852. Jean Baptiste Meeus, Arlon, Belgium—An improved method of multiplying motive power, and transmitting it to a shaft or other mechanism.

Dated 3rd July, 1857.

1854. Matthew Clark, Alexandria, Dumbarton—Improvements in the preparation of cloth for Turkey red dyeing.
1856. Charles Topham, Hoxton—An improved apparatus for raising and forcing liquids.
1858. John Fordred, Stoke Newington—Improvements in treating and purifying water.
1860. John Edmund Gardner, 453, Strand—Improvements in illuminated clocks, and in the apparatus employed for lighting the same.
1862. John Agar and William Agar, Bury—Improvements in watches and keys for the same.

Dated 4th July, 1857.

1864. Robert Gibson, Joseph Gascoigne, and Samuel Gibson, Hunslet, Yorkshire—Improvements in boilers for generating steam.
1866. Michael Henry, 17, Fleet-street—An improved machine for cleaning and crushing grain. (A communication.)
1868. George Grantham and Henry Sharp, Liverpool—Improvements in working the valves of steam-engines.

Dated 6th July, 1857.

1872. William Munt, 16, Charter House-lane, Smithfield—A shank to be attached to all descriptions of buttons, to be called an eylot shank.

Dated 7th July, 1857.

1874. Charles Faulkner and David Faulkner, Birmingham—Improvements in gun and pistol barrels, and in cannons, and in furnaces for the same.
1876. William Dawes, Wellington, Salop—Improvements in the pistons of steam engines.
1878. Richard John Badge, Newton-heath, near Manchester—Improvements in railway chairs.
1880. Frederick Bousfield, 20, Hereford-terrace, De Beauvoir-town—Improvements in the manufacture of soap.
1882. Peter Armand le Comte de Fontainemoreau, 39, Rue de l'Echiquier, Paris—Certain improvements in apparatus for the manufacture of boots and shoes, which apparatus is also applicable for uniting other articles together. (A communication.)
1844. Peter Hyppolyte Gustave Berard, 323, Rue St. Denis, Paris—Improvements in manufacturing and applying concentrated collodion.

1886. William Smith, Kettering, Northampton—Improvements in horse hoes and drills.

1888. Richard Archibald Brooman, 166, Fleet-street—Improvements in vices. (A communication.)

1890. Richard Archibald Brooman, 166, Fleet-street—Improvements in connecting carriages and waggons on railways. (A communication.)

Dated 8*th July*, 1857.

1892. William Edmondson Jones, Glades Spring, Virginia, U.S.—An improvement in trees of riding saddles.

1894. George Green, Whitehorse-lane, Mile-end-road—Improvements in machinery for the manufacture of casks, barrels, and other similar articles.

1896. Jules Joseph Henri Brianchon, Paris—Improvements in colouring and ornamenting glass, porcelain, earthenware, and other ceramic substances.

1898. Harry Nicholas Nissen, Mark-lane—An improved method of making impressions similar to water-marks upon paper.

1900. Louis Albert Bahn, Greek-street, Soho—Improvements in the manufacture and application of certain metallic alloys.

1902. Nicholas Marshall Cummins, Annmount, Cork—Improved means for indicating the proximity of icebergs. (A communication.)

Dated 9*th July*, 1857.

1904. Arthur Dobson, Belfast—Improvements in machinery or apparatus to be used in bleaching, washing, starching, airing, and finishing fabrics, and in sizing yarns.

1906. John Holley Swan, 16, Royal Exchange-square, Glasgow—Improved machinery and steam engine for crushing quartz and other hard substances, and for amalgamating.

1908. John Julius Cléro de Clerville, Newman-street—Improvements in the manufacture of oil-cloth and imitation leather. (A communication.)

1910. Richard Archibald Brooman, 166, Fleet-street—An improvement in propelling ships, boats, and other vessels. (A communication.)

1912. William Mann, City of London Gas Works—An improved arrangement of steam boiler, gauge cocks, and registering apparatus connected therewith.

1914. Thomas Lewis and Henry Parrish, Birmingham, and Robert Martin Roberts, Dolgelly, Merionethshire—Improvements in the separation and extraction of copper from its ores.

Dated 10*th July*, 1857.

1916. Eastwood Eastwood, Burnley, Lancashire—Improvements in picker bands for looms.

1918. Thomas Vicars, senr., Thomas Vicars, jun., Thomas Ashmore, and James Smith, Liverpool—Improvements in the manufacture of bread, biscuits, and like articles, and in the machinery connected therewith.

1920. David Hope, Bishop Auckland, Durham—An improved method of preventing one train from running into another on railways.

1922. Richard Archibald Brooman, 166, Fleet-street—Apparatuses for scouring or extracting oil and grease from wools and woollen fabrics, and for extracting gum and gummy matter from silk. (A communication.)

1924. William Edward Newton, 66, Chancery-lane—Improvements in the construction of furnaces and steam boilers. (A communication.)

1926. William Smith, Little Woolstone, near Fenny Stratford, Bucks—Improvements in steam engines for giving motion to agricultural implements.

1928. George Dyson and Thomas Harrison, Tudhoe Iron Works, near Ferry-hill, Durham—An improvement or improvements in steam-engines.

1930. John Chanter and David Annan, Bow, Middlesex—Improvements in furnaces when moveable bars are used.

Dated 11*th July*, 1857.

1937. Bernard Denizot and Charles Flipps, 39, Rue de l'Echiquier, Paris—An improvement in the construction of railway breaks.

Dated 14*th July*, 1857.

1955. James Webster, Birmingham—An improvement or improvements in safety valves.

1957. Jeffries Kingsley, 15, Bedford-square—Obtaining or applying a primary motive power, namely, the water of a river, which causes a vacuum in an exhausting receiver, which may be transferred by tubes to other machines causing water and ores to be raised from mines, likewise causing the steam-engine to be superseded, water being cheaper than coals.

1959. Gustavus Palmer Harding, Jewin-street—Improvements in the manufacture of hats, caps, and other coverings for the head

1961. Thomas Mosdell Smith, Hammersmith—Improvements in the preparation of materials applicable to the manufacture of candles.

Dated 15*th July*, 1857.

1963. François Moulin, Lyons, France—A new improved railway brake.

1965. John Henry Quick, Pimlico—An improved hat.

1967. Richard Archibald Brooman, 166, Fleet-street—Improvements in the manufacture of hats, bonnets, and other coverings for the head. (A communication.)

1969. John Henry Johnson, 47, Lincoln's-inn-fields—Improvements in machinery or apparatus for marking or imprinting characters on paper and other fabrics. (A communication.)

1971. John Henry Johnson, 47, Lincoln's-inn-fields—Improvements in sewing machines. (A communication.)

Dated 16*th July*, 1857.

1973. James Wright, 10, Alfred-place, Newington-causeway—Improvements in the manufacture of gas.

1975. William Armand Gilbee, 4, South-street, Finsbury—Improvements in the treatment of fatty matters for the manufacture of candles and night lights. (A communication.)

1977. George Samuel Mathews, 61, Wardour-street—Improvements in railway breaks.

Dated 17*th July*, 1857.

1979. John Avery, 32, Essex-street, Strand—Improvements in steam engines. (A communication.)

1981. Joseph Russell, Woodlands-road, Blackheath, Henry William Spratt, Granville-park, Lewisham, and William Press, 16, Stepney Causeway, Commercial-road East—A certain new method or methods, or new improvement or improvements in the construction, application, and use of machinery for propelling boats, ships, or vessels of any class or denomination.

1983. Thomas Foxall Griffiths, Birmingham—An improvement or improvements in shaping metals.

1985. Thomas Clunes and John Macintosh, Aberdeen, N.B.—Improvements in machinery or apparatus for bottling or supplying vessels with fluids.

1987. Samuel Ramsden, Hunslet, near Leeds—Improvements in the construction and fixing of window sashes.

Dated 18*th July*, 1857.

1989. Augustus Dacre Lacy, Hall-house, Knayton, Yorkshire, and William Collett Homersham, Adelphi-terrace—Improvements in machinery for ploughing and cultivating land by steam or other suitable motive power.

1993. William Edward Newton, 66, Chancery-lane—Improved machinery for cutting metals or other hard substances. (A communication.)

Dated 20*th July*, 1857.

1997. George John Newbery, Straitsmouth, Greenwich—Improvements in window blinds.

2001. Thomas Restell, New Kent-road—Improvements in breech-loading fire-arms, and in fastening the barrels of fire-arms to their stocks.

2003. William Edward Newton, 66, Chancery-lane—Improvements in reaping and mowing machines. (A communication.)

2005. Henry Vennor Cowham, Skeffling, Yorkshire—Improvements in machinery for breaking or pulverising land.

2007. Samuel Butler, Nottingham—Improvements in the manufacture of ornamental bobbin net, or twist lace.

Dated 21*st July*, 1857.

2009. George Parsons, Martock, Somerset—Improvements in thrashing machines known as combined thrashing machines.

2011. Andrew Scott, 15, Charlotte-terrace, Copenhagen-street, Islington—Improvements in stops for gates and doors.

2013. Josef Mohr, Vienna—Improved machinery for propelling vessels.

Invention with Complete Specification Filed.

2023. Jean Jacques Bouvert, and François Isidore Jean Pascal, Paris—Improvements in smoke-preventing apparatus.—23rd July, 1857.

WEEKLY LIST OF PATENTS SEALED.

July 31*st*.

289. William Hargreaves.
294. Daniel Howorth.
297. William Henry Holding and James Robert Casbay.
309. Florentin Garand.
339. William Green.
356. William Greenslade and James Wood.
394. Thomas Howard.
397. John Talbot Pitman.
407. Joshua Horton, junr.
414. Isaac Blackburn and Robert Blackburn.
447. William Robinson Jackson.
465. Jean Baptiste Pascal.
644. William Holland.
751. Modeste Anquetin.
923. William Henry Box.
1030. Thomas Robert Winder.
1101. Henry Heald.
1118. William Crighton and Peter Foxcroft.
1248. Peter Fairbairn and Thomas Marsden.
1260. Jules Alexandre Petiet.
1302. Caleb Tayler.
1303. Charles Edward Darby.
1316. Henry Hobbs and Edward Easton.
1327. Alfred Vincent Newton.
1397. William Edward Newton.

August 4th.

57. Charles Frederick Claus.
338. Henry Myers, Charles Askew, and John Askew.
351. Charles Crickmay.
355. Joseph Skertchly.
378. Abel Stokes.
429. Noel Clayton Smith.
431. John Lawson and Stephen Cotton.
433. Richard Houchin, junr.
467. Frederick Burnett Houghton.
540. Joseph Robinson.
704. William Makin.
749. William Edward Newton.
807. Henry Dolby and Edwin Thomas Dolby.
911. George Lowry.
1156. John Thomas Way.
1357. George Woodward Morseh.
1533. FerdinandCharles Warlic.
1617. Thomas Hale.

Patents on which the Stamp Duty of £50 has been Paid.

July 27*th*.

1681. Henry Walduck.
1708. Edward Hallen.
1709. Louis Player Miles.

July 28*th*.

1665. Richard Johnson.
1686. Joseph Green and William Jackson.
1847. William Edward Newton.

July 31*st*.

1787. William Kennard.

Journal of the Society of Arts.

FRIDAY, AUGUST 14, 1857.

NOTICE TO INSTITUTIONS.

The Council having purchased from the Messrs. Longman a number of copies of the Society's Reports on Industrial Instruction, for the use of the Institutions in Union, the Secretary will be prepared to send copies, free of charge, to any of the Institutions applying to him for them.

THE SOCIETY'S VISIT TO MANCHESTER.

In accordance with the original notices of the Society's intention to visit Manchester, the members who had applied for their cards arrived in that city, with their friends, on Monday, the 3rd instant. The officers were in attendance to meet them at the reception rooms in George-street, Manchester, which the Literary and Philosophical Society had kindly placed at the disposal of the Society of Arts. The Local Committee, with Mr. George Peel and Mr. Henry Newall, the Honorary Local Secretaries of the Society for Manchester and Rochdale, afforded valuable assistance in the preparation of the following Programme, which was placed in the hands of the members on their arrival:—

PROGRAMME.

Monday, August 3.—Reception Room, Literary and Philosophical Society's Rooms, 36, George-street, Manchester. Members and their friends are requested to register their addresses in Manchester.

Tuesday, August 4.—Visit to the Exhibition.

Wednesday, August 5.—Excursion to Saltaire, Titus Salt and Co., (Worsted and Alpaca.) To Leeds: Marshall and Co. (Flax), and Peter Fairbairn and Co., Engineers. To Halifax: James Akroyd and Sons (Worsted). A special train will leave Victoria Station (Lancashire and Yorkshire), at a quarter to nine o'clock, on Wednesday morning. Fare 8s. to Halifax, Bradford, Leeds, and back. The railway from Bradford, on the Midland line, to Saltaire, will be charged in addition,—the distance is about six miles. Persons wishing to join the excursion on Wednesday must enter their names as early as possible on Tuesday. At eight o'clock the members and their friends are invited to a soirée, at the Royal Institution, Mosley-street. The Society's card to be shown on entering. Ladies are invited. Evening dress.

Thursday, August 6.—Visit to Mills, &c., in Manchester and the neighbouring towns. Rochdale—Bright and Co. (Carpet Works), Kelsall and Kemp (Flannel), Radcliffe and Sons (Cotton Shed); Oldham—Platt Brothers (Engineers); Middleton—Thomas Dickins (Dye Works and Silk Reeling). The train will leave Victoria Station (Lancashire and Yorkshire Line) for Rochdale. at 8.40, arriving at 9.5, returning from Rochdale to Middleton Junction at 1.21, arriving at 1.37, whence parties can visit Oldham or Middleton by train.

Friday, August 7.—Visit to the Exhibition. The Society's Dinner will take place at four o'clock precisely, at the Art Treasures Exhibition Building; Thos. Bazley, Esq., in the chair. Tickets, 8s. 6d. each, to be obtained at the Reception Room, George-street; the Art Treasures Hotel, Aytoun-street, near the Infirmary; and also at Mr. Deane's Office, Art Treasures Exhibition Building. Members are requested to take their dinner tickets before mid-day on Thursday, at the latest. Ladies will be present at the dinner. Morning dress.

Saturday, August 8.——

List of Places to be Visited.

⁂ It is to be distinctly understood that members have not permission to visit works where a manufacture is carried on of a similar character to any in which they may be engaged, or may be personally interested.

Armitage, Sir Elkanah and Sons, Cotton Mills, Pendleton, by Greenwood's omnibus to the Pendleton terminus. To be seen at half-past 2 each day except Saturday.

Akroyd, James and Sons, Worsted Mills, Halifax. Wednesday's excursion.

Armitage and Ward, Cotton Mills, Rodney-street, top of Jersey-street, Ancoats, Manchester. One mile from Piccadilly cab-stand. Before one o'clock in the day.

Athenæum: Reading-room, Bond-street, Mosley-street.

Bellhouse, Edward T. and Co., Iron Works, "Eagle Foundry," Hunt-street, Oxford-street, Manchester, near Oxford-road Station.

Bradshaw and Hammond, Print Works, Levenshulme.

Bright, Brothers, Carpet Works, Rochdale.

Cheetham's Library, Hunt's Bank, near the Cathedral. Open from ten to five o'clock.

Dickins, Thomas and Co., Spring Vale Dye Works, Middleton. Six miles from Manchester by Lancashire and Yorkshire Railway, or by Greenwood's omnibus from Shudehill.

Devoge, Z., Jacquard Machine Maker, 1, Sycamore-street, Oldham-road, Manchester.

Exchange, Royal: News Room, Market-street.

Fairbairn, William and Sons, Iron Works, Canal-street. Any time from nine a.m. to one.

Fairbairn, P., and Co., Iron Works, "Wellington Foundry," Leeds.

Fletcher, S. Son and Co., Warehouse, Parker-street, Manchester, behind the Infirmary.

Free Library, Byrom-street, Camp Field, end of Deansgate. Open from ten a.m. to nine p.m.

Hoyle, Thomas, and Co., Mayfield Print Works, Buxton-street, London-road, Manchester. Printed forms of orders will be required, and may be obtained at the Warehouse, 58, Mosley-street. Time: between nine and eleven in the morning, and two and four in the afternoon.

Houldsworth, Thomas and Co., Cotton Mills, Newton-street.

Infirmary, Royal.

Kershaw, Leese, Sidebottom, and Co., Cotton, India Mills, Stockport. Heaton Norris nearest station; seven miles from Manchester. Wish to be informed on what day the visit will be made. Warehouse, Portland-street, next to the Queen's Hotel.

Lockett, Joseph, Sons, and Leake, Strangeways Engraving Works, between 10 and 1 a.m. and 3 and 5 p.m., on all days but Saturdays.

Mather and Platt, Iron Works, Salford.

Muir, William and Co., Toolmakers; Iron Works, "Britannia Works," Strangeways.

Marshall and Co., Flax Mills, Leeds. Wednesday's Excursion.

Museum, Peel Park.

Molineaux, Webb, and Co., Flint Glass Works, Kirby-street, Manchester. These Works are near Messrs. William Fairbairn and Sons, Parr, Curtis, and Co., and Peel, Williams, and Co. Tuesday or Wednesday the best days.

Nasmyth, James, and Co., Iron Works, "Bridgewater Foundry," Patricroft. Six miles from Manchester by rail from Victoria Station.

Oxford-road Twist Company, Cotton Mills, Manchester.

Philips, J. and N., and Co., Warehouse, 35, Church-street.

Pender, John, and Co., Warehouse, Mount-street.

Parr, Curtis, and Co., Iron Works, Chapel-street.

Peel, Williams, and Peel, "Soho Iron Works," Pollard-street.

Platt, Brothers, and Co., Machine Makers, &c., Oldham. Six miles from Manchester, by Lancashire and Yorkshire Railway, Victoria Station.

Percival, Yates, and Vickers, Flint Glass Works, Jersey-street, Ancoats. Tuesday or Thursday best days.

Peel Park Museum and Library, Crescent, Salford. By omnibus from Market-street.

Portico Library, Mosley-street, Manchester.

Potters and Norris, Warehouse, 1, George-street, Manchester, behind the Infirmary.

Richmond and Chandler, Agricultural Implement Works, Salford.

Radcliffe, Samuel, and Sons, Cotton Mills, Rochdale. Thursday preferred. By Lancashire and Yorkshire Rail to Rochdale.

Ragged Industrial Reformatory Schools, 1, St. John's-parade, Manchester. Children are kept at ordinary school work until twelve at noon, and from two to five is set apart for industrial occupation. J. T. Bryan, Governor, wishes to be informed what day the visit will be made.

Sharp, Stewart, and Co., Engineers, Oxford-road. Not more than ten in a party, who would walk through in an hour.

Salt, Titus, Sons and Co., Worsteds, &c., Saltaire, Bradford. Wednesday's excursion.

Seedley Printing Company (Print Works), Seedley, Pendleton. Two-and-a-half miles distant, and may be conveniently reached by Greenwood's Omnibuses, leaving Market-street every quarter-of-an-hour.

Sykes, Richard, Bleach Works, Stockport.

Spence, P., Alum Works, Pendleton. By Greenwood's omnibus to the terminus at Pendleton. These works are near Sir Elkanah Armitage and Sons' Cotton Mills.

Watts, S. and J. and Co., Warehouse, Fountain-street; and their new warehouse now erecting in Portland-street.

Whitworth, Joseph and Co., Tool Makers, Iron Works, Chorlton-street, Portland-street, Manchester.

Walton, James and Co., Cardmakers, Denton. Train to Stockport Station; Cab to Bredbury. Cast Iron Mill, five stories high, and school, two stories high. It will be the best to form a party, and go direct by omnibus; about seven miles.

Water Works (Manchester Corporation), by Manchester. Sheffield, and Lincolnshire Line.

(Here followed a list of the principal hotels and dining rooms.)

In addition to the above programme, Mr. J. C. Deane, General Commissioner for the Art Treasures Exhibition, kindly drew up for the use of the members the following suggestions for their guidance in examining the collection:—

Visit of the Society of Arts to the Art Treasures Exhibition, August 5th, 1847.

Refer to the Ground Plan on the back of the Catalogue.

Upon entering the building at the general entrance, eastern end, turn to the left, and proceed up the Gallery of Ancient Masters to its western end, saloon A, which contains specimens of earlier German, Classic, and Italian art. *See page* 13 *of the Catalogue.* Then return to Vestibule 1, which contains exclusively Italian and early Spanish pictures, page 27; thence to Saloon B, page 30, which contains pictures by the Venetian and Bolognese Masters arranged chronologically. Then into Vestibule 2, page 50, which is devoted to Spanish Art and the works of Murillo. Thence to Saloon C, page 51, which contains pictures by French, Flemish, and Spanish Masters. Leaving the gallery by the door at which you entered, proceed to the Clock Gallery by the nearest stair-case, where there is a miscellaneous collection of Ancient Masters, page 60.

Passing by the clock to the south side, there are some specimens of the modern French School, page 105; including some of Ary Schaeffer's most celebrated paintings. Leaving this gallery by the opposite staircase to which you entered, you proceed to the gallery of Modern Masters by the first entrance to the right, which leads into Saloon D, page 77, where are exhibited paintings by the earlier English Masters; proceed then to Vestibule 3, page 85, Saloon E, page 87, Vestibule 4, page 96 Saloon F, page 98, which contain pictures by Modern Masters.

The British Portrait Gallery commences in the centre hall, near the staircase over the book stall, with a portrait of Henry IV, page 111, and terminates at the staircase opposite, immediately over the medal press opposite the book stall.

Saloon H is at the western end of the building, and is entered from the south side of the transept; it contains Dutch and Flemish pictures and the pictures contributed by the Marquis of Hertford, page 66. This Saloon leads to the

Water Colour Gallery, which contains the "Long Gallery," and two adjoining rooms. The Water Colour Gallery commences page 190, picture number 423, near the entrance to the Oriental Court. The two small rooms leading from the "Long Gallery" at the extreme end of the building, are respectively devoted to the works of the Earlier Masters in Water Colours and to Turner's Drawings.

From the "Long Gallery" you enter the Oriental Court. Thence through the transept to the gallery over the book stall, where will be found the collection of minatures, page 207. Next to these, in this gallery, are the engravings, photographs, and on the opposite side the original drawings, for the examination of which it will be necessary to procure a *Supplemental Catalogue.*

The Armour, collected by the late Sir Samuel Meyrick, page 154, will be found under where the Portrait Gallery commences; on the screen against the staircase is his portrait. Case I, south side, contains armoury and arms; on the opposite side, in case L, are arranged the Douce Ivories.

The General Museum of Art will be found collected and arranged in the glass cases in the central hall, commencing at case A, page 137, near the entrance of the Ancient Gallery. Case B, page 140, contains enamels, Case C, page 142, contains porcelain. Case D, page 144, contains oriental china. Case E, page 145, contains Majolica ware, &c. Case F, page 148, contains specimens of the goldsmith's art, and metal work. Case H, page 149, contains sculpture in bronze, terra cotta, &c. Case I, page 151, contains carvings in ivory. The cases Q, R, S, T, and U, contain the Government contributions from the British Museum and Marlborough-house, known as the Bernal collection. Proceeding up the central hall, by the glass cases, you enter the court containing the Soulage collection, of which a catalogue can be obtained in the court.

The first class refreshment room adjoins the open court near the Botanical Gardens.

The second class refreshment-room is near the railway entrance, and is accessible from the transept by the large tent.

Entrance to the Botanical Gardens 6d., return to the Exhibition, except to holders of season tickets, 1s.

Members of the Society of Arts will be allowed to visit Her Majesty's reception room, on presenting their cards.

On Tuesday, the 4th inst., the members were occupied in visiting the Art Treasures Exhibition.

On Wednesday, the 5th, upwards of 80 members and friends of the Society left Manchester, at a quarter before nine o'clock, and proceeded by the Lancashire and Yorkshire Railway to Bradford, and thence to Saltaire, where they were received by Mr. Titus Salt and his son, and courteously shown over the whole of their extensive and magnificent works. A luncheon was then served in the dining-room adjoining the counting-house of the works. The party next proceeded to Leeds, where some of the members visited the works of Messrs. Marshall, flax-spinners, and others went to see the machine works of Mr. Peter Fairbairn. A special train, leaving Leeds at four o'clock, brought the party back to Manchester. At eight o'clock, a soirée was held in the rooms of the Royal Institution, to which the members and their friends had been invited. The time occupied in the above visits and the arrangements on the railway did not permit an inspection of Messrs. Akroyd's worsted mills.

On Thursday, the majority of the members occupied themselves in visiting the mills, &c., in Manchester and the neighbouring towns. At 8.40 a.m., a train started for Rochdale, where the party visited the Carpet-works of Messrs. Bright and Co., the Flannel-works of Messrs. Kelsall and Kemp, and the spacious Cotton-shed of Messrs. Radcliffe and Sons. From Rochdale one portion proceeded to Oldham, to inspect the Machine-shops of Messrs. Platt, Brothers, whilst the other portion proceeded to Middleton, and went over the Dye-works and Silk-reeling establishment of Mr. Thos. Dickins. The party was hospitably entertained by this gentleman. Another train, at 9.45, conveyed a number of the members to Bolton, for the purpose of visiting the factory of Messrs. Gardner and Bazley, cotton-spinners, in that neighbourhood. Mr. Bazley accompanied the party over his works, and afterwards entertained them at luncheon. The schools in connexion with these mills excited much interest. In the evening, Mr. William Fairbairn entertained the Vice-Presidents, members of the Council, and the Secretary at dinner.

On Friday, the 7th, the Society's Dinner took place at the Art Treasures Exhibition Building. The chair was occupied by Thomas Bazley, Esq., president of the Manchester Chamber of Commerce, and he was supported by the Bishop of Manchester; Sir John Richardson, F.R.S.; the Mayors of Salford, Bolton, Stockport, Preston, Oldham, and Ashton; Mr. William Fairbairn, F.R.S.; Mr. Thomas Fairbairn, Chairman of the Executive Committee of the Art Treasures Exhibition; Messrs. Joseph Glynn, F.R.S., George F. Wilson, F.R.S.; Rev. Dr. Booth, Chairman of the Council of the Society of Arts, and Mrs. Booth; Messrs. Matthew Marshall, Thomas Winkworth, and Miss Winkworth; Messrs. Roger Fenton, Edmund Potter, Joshua Radcliffe, Alger, R. L. Chance, J. Leighton, F.S.A., S. Sterne (Ashton), D. Chadwick, R. T. Fauntleroy, Thomas Clegg, J. Dillon, J. Vavasour, H. Newall, T. Dickins, P. Palmer, W. B. Simpson, W. Muir, J. Hambleton, John Wilson, Dr. Watts, &c. Grace having been said by the Bishop of Manchester,

The Chairman proposed "The Queen," which was drunk with the usual honours. He next proposed "The Prince Consort, the President of the Society of Arts, and the rest of the Royal Family."

The Chairman then proposed "The Society of Arts." He said this Society deserved the thanks of the community in that great district. They came here as the pioneers of progress, on a pilgrimage to this palace of the treasures of art, and he ventured, on behalf of the inhabitants of Manchester, to thank them for their presence on this occasion. The Society had had a youthful existence of more than a century, and yet he believed its career was only in reality beginning. But a century ago the Society indicated what we still felt the need of, a national and general education. The Society felt then, as we felt now, that the mental resources of the people of this country required to be developed, and, therefore, they came among us spreading intelligence, and encouraging us to proceed with all the energy in our power in promoting the common instruction of the people at large, and also the superior instruction, by means of art, of the higher classes of the community. From 1754 to 1857, the career of the Society of Arts had been one of continuous and uninterrupted application to the great and solid interests of the people of this country, and it was only doing them an act of justice to acknowledge the services they had rendered. In 1851 they promoted, most successfully, the Great Exhibition, which shone like a beacon through the civilised world, and attracted alike the people of Europe, Asia, Africa, and America. And the material interests of Lancashire had not been overlooked by the Society of Arts. After the Exhibition of 1851, the Prince Consort suggested, and the Society of Arts adopted the suggestion, that comments should be given, in the shape of lectures, on the branches of industry that were displayed in the Exhibition, and that called forth some remarks connected with the industry that employed the people of Lancashire. The subject of cotton had not been neglected, but the Society had been the constant friend of the promotion of an increased supply. He was glad to see his friend Mr. Clegg present, who had done so much to promote the growth of cotton in Africa, and he believed that they owed Mr. Clegg's presence amongst them to the services of the Society of Arts, especially in reference to an increased supply of cotton. He hoped that, as this was a particularly practical age in which we were privileged to live, that the labours of the Society of Arts would be directed to everything that could tend to develop the mechanical, moral, social, and mental progress of the people of this country. The Chairman then alluded to the certificates of merit granted by the Society of Arts, end expressed a hope that the Society would have the co-operation of the people of Manchester and of the United Kingdom, in the great objects it had in view, the promotion of the arts, science, and manufactures. The toast having been drunk,

The Rev. Dr. Booth responded. He said it was true the Society of Arts was a very old Society, and he might perhaps illustrate what the chairman had said by calling to mind one or two of those matters in which the Society might be said to have done the state some service. It was peculiarly proper he should first call their attention to the fact that the first exhibition of paintings in this country was held in 1760, in the rooms of the Society of Arts, the artists of London having resolved to raise a sum for purposes of charity by the annual exhibition of their works. This was followed by another of a similar character in the next year. The consequence was, that two years afterwards the foundation of the Royal Academy of Painting was laid. A charter was subsequently granted, in which it was expressly stated that while it should cultivate the art of painting, it should not infringe on the arts connected with manufacture or commerce. The Society of Arts was the first to stimulate the production of wine in Australia, having offered a prize for the first specimen which was brought to this country. The Society also introduced gutta percha, after specimens originally sent from Singapore had been declared valueless, and returned. He might mention many other matters, but he must refrain. He might say, however, that the true province of the Society was not to work out details, but to be the expounder of new principles, and leave the application of those principles to others. The Society was the first to acknowledge the principle of international competition and comparison, first exhibited in that great display of the industry of nations which, as it was the most original in its conception, so it was the most successful in its results. The Society was the first to show the country an educational exhibition, such as was now being shown at South Kensington. The Society had also established the Trade Museum. It was in that way that the Society was calculated to do the greatest service. The Society had in former times encouraged the arts, manufactures, and commerce of this city of Manchester; but the day had long gone by when any society, any voluntary association, or even the Government could encourage either the manufactures, the arts, or the commerce of this locality. It would be impertinence in the Society of Arts to presume to do so. Was not the glorious display by which they were surrounded a proof of the promotion of art in this locality? Did not these forests of chimneys display the manufactures of Manchester? And did not the railways which run from this centre towards every point of the compass bear witness to the extent of her commerce? Dr. Booth then referred to the interesting meetings he had attended at Huddersfield, in connection with the certificates of merit presented to the deserving members of the Mechanics' Institutions, and said that he did not see why the Society of Arts should be any longer exclusively a metropolitan institution; he did not see why it might not visit annually, in succession, the large towns in the kingdom in the same way as the British Association did. There were men of great originality of thought and of patient research residing in the country, who, at the Society's provincial discussions, might throw new light on many of the subjects, in the consideration of which the Society of Arts were now engaged. These men could not be expected to spend their time and money in attending the usual weekly meetings of the Society. The Society might be divided into sections, have papers read, reports made, and discussions held, on questions of commerce, the colonies, inventions, education, sanitary improvements, and the like. Thus a week in autumn might be passed pleasantly, and not without instruction. But as he was now speaking only his own individual sentiments, he would not enlarge on this, which, in his opinion, would be a second era in the progress of the Society. He concluded by remarking that Manchester, besides its pre-eminence in the arts, manufactures, and commerce, had claims upon the respectful attention of the Society of Arts, because there the first provincial literary and philosophical society in the kingdom was established—and because it was a city equally pre-eminent in literature and science, as in manufactures and commerce. He had to propose "The literature and science of Manchester," coupling with the toast the name of the Bishop of Manchester.

The Lord Bishop acknowledged the toast, and called the attention of the meeting to the paucity of the attendance of the working classes at the Exhibition. It was not that they were not interested in it, but because they had not been properly educated to appreciate its treasures. He would impress upon the Society the necessity of giving greater instruction in art, and providing some means for making the schools of art more intellectual, and furnishing the students with some acquaintance with the records of the past, which would enable them to enter more fully into the spirit of the scene which they attempted to pourtray on canvas. After passing a panegyric upon the late Bishop Blomfield, his lordship said he referred to his deceased friend now, because he had occupied an office which had been for years a sinecure, and with respect to which the Society of Arts should earnestly urge upon the attention of those who elected to it, the necessity of making it efficient. Why were the professors of the Royal Academy never permitted to lecture, except on painting and sculpture? It was true there had been the discourses of Reynolds, Phillips, Opie, and Flaxman, on subjects connected with art, and why should not the highest branch of historical art be duly developed by the person appointed to teach history in the Royal Academy of England? He hoped this subject would receive the attention which it deserved.

Mr. Joseph Glynn proposed the health of "The members of the Executive Committee of the Art Treasures Exhibition," which was responded to by

Mr. Thomas Fairbairn, the chairman, who said the committee had done all in their power to ensure the success of the Exhibition, but there must be still half a million of people brought to Manchester before the Exhibition closed; and he hoped the railway companies would bring the people from all parts of the country at as low a rate as would be remunerative. Mr. Fairbairn concluded by proposing "The Mayors of Manchester and Salford, and the neighbouring municipalities."

The Mayor of Salford acknowledged the toast.

Mr. Winkworth said that as one of the vice-presidents, he rose to propose the health of the chairman, who as President of the Chamber of Commerce of Manchester, emphatically represented in that great city the special objects of the Society, namely, arts, manufactures, and commerce. The interests of humanity were powerfully subserved by the correct working of those true principles of political economy which were professed by that important association, for it was upon their greater or less adoption that the moral, social, and intellectual welfare of the community at large mainly depended. The claims of Mr. Bazley to the esteem of that assembly were too well-known and appreciated, as well by his fellow-citizens as by the members of the Society of Arts then present, to render a more extended notice of them necessary; they had to thank him for the readiness with which he had consented to preside on this occasion, and for the intelligent and agreeable manner in which he had discharged the duties of that position. Mr. Winkworth concluded by proposing the health of the chairman.

Mr. Bazley, in replying, proposed "The Ladies," and called upon the Mayor of Ashton to respond.

The Mayor of Ashton returned thanks.

Mr. William Fairbairn then proposed "Mr. Foster, Secretary of the Society of Arts," and Mr. Foster acknowledged the compliment.

Saturday, the 8th, the members visited Peel Park and Museum, the Salford Free Library, and various mills and establishments in Manchester, and thus terminated the Society's visit.

Those members of the Society who were present during the visit to Manchester, and who availed themselves of the opportunity of visiting the various mills and manufactories, so liberally thrown open for their inspection, cannot fail to have been impressed with the advantages which would result from periodical visits of a similar character, to the various manufacturing districts of the kingdom. The opportunities thus afforded to the Society of witnessing the progressive development of the industries of the country, the introduction of new raw products, and the modification in the treatment of those already known,—opening up new sources of employment,—would enable the Society more effectually to promote the great objects for which it was established.

CONNECTION FOR GAS, WATER, AND STEAM PIPES.

Messrs. Smith and Phillips, of West Smithfield, have recently patented an expeditious and economical method of connecting pipes or tubes, which is said to obviate, by very simple means, the defects of those plans now commonly in use—namely, the common socket pipes, with lead and yarn, and the turned and bored joints. The first of these is expensive, taking both labour and time, and has also the great disadvantage of always requiring a fire. The joints are sound only so long as they remain undisturbed, and the lead being neither compressible nor adhesive, in the event of the earth settling and the consequent sinking of the pipes, it becomes loosened in the socket, and leakage ensues. In the method with turned and bored joints, when the ground settles, the pipes in many instances break, and if this does not take place, there is always a great amount of leakage; the pipes must also be laid in a very perfectly straight line, which is in itself a great disadvantage.

Fig. 1.

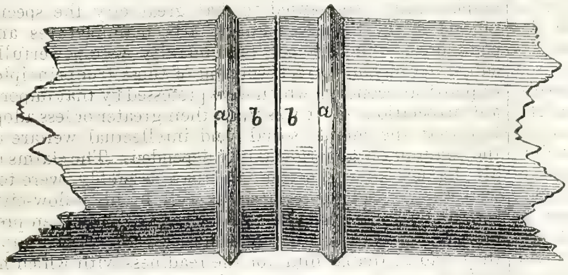


Fig. 2.

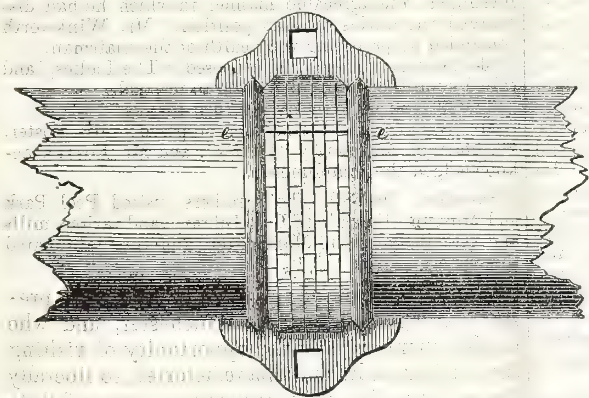
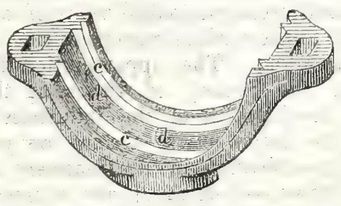


Fig. 3.



In this invention, all these disadvantages are stated to be remedied by a very simple process. The pipes are all cast with both ends alike, that is, with two spigot ends (see figure 1). Where the ends of two pipes are placed ready for being joined they may be either straight or on the bevil. A short distance from the end of the pipe a ring or collar is cast round the outside, as at *a*, *a*. A space between the collars, *b*, *b*, is to be covered with gasket, as shown in figure 2. This flat-wove gasket is manufactured especially for this purpose, so as to fit the space at *b*, *b*, which varies in width with the diameter of the pipe; this, when applied, is to be covered freely on one side with a mixture of red and white lead. Figure 3 shows the construction of the clips for containing the gasket and fastening the ends of the pipes together; *c*, *c*, are two grooves on either side, to fit on the collars, which are on the outer surface of the pipes, as at *a*, *a*, figure 1. *d*, *d*, is the cavity between, to correspond with the space *b*, *b*, as in figure 1, and to enclose the gasket, as shown in figure 2. The following is the process of fastening together the pipes:—Place the ends of the pipes together, as at figure 1, either straight or on the bevil, as may be required, and so as to rest steadily in their places. Measure a piece of gasket from the roll just sufficient to go round the pipe twice; spread on one side freely with a mixture of red and white lead; draw it tightly over the space marked *b*, *b*, between the collars in figure 1, as shown in figure 2, and finish in the second fold exactly at the point where the gasket commenced, as at *e*, *e*, in figure 2, so that there may be no overlapping. This is of the utmost importance, in order to maintain a uniform pressure all round. Having covered the interior surface of the clip freely with the mixture of red and white lead, place the lower clip on first, following the folding of the gasket, and then apply the upper clip in the same way, so as to secure the end of the gasket; the bolts may then be worked alternately until they are quite home; the joint is now complete and fit for immediate use.

The simplicity of the plan is at once obvious; it is said to have been successfully tried under every possible contingency. Leakage, if not altogether removed, is greatly diminished. The pipes may be laid at a greater inclination than under the old system, for the material of which the joint is made will yield to the sinking of the pipe. There is no necessity for a large excavation for repairing, and a fire is not required. In the event of fracture, instead of having to cut away the part with a chisel, a work of labour and time, a new length of pipe can be easily inserted and fastened. This effects a saving in the number of workmen employed. By the substitution of this connecting joint for the old lead and yarn, a saving of at least 75 per cent. is said to be effected. This plan is suitable for gas works, for locomotive purposes and large manufactories, for builders and contractors, for conservatories, breweries, and distilleries, and for all other purposes whatsoever, wherever a pipe is required.

In the early part of 1856, about six miles of pipes, of various sizes, were laid down in the town of Halifax under the direction of the borough engineer. After a trial of twelve months, the pipes were laid bare for examination, and in every instance the joints were found as sound as when first laid down. Numerous other trials have been made, with the same satisfactory results. The pipes have also been subjected to a severe test above ground, with a pressure varying from 150 to 160 feet head of water, the joints remaining firm under the trial.

A SHORT-HAND FOR THE ELECTRIC TELEGRAPH.

By Hugo Reid, of Dalhousie College, Halifax, N. S.

That the very great advantages which the telegraph is capable of conferring may be extensively diffused, and not shut out from any class, it is necessary that telegraphic communication be *cheap*. The great obstacle to this cheapness is the *time* its operations require, caused by the number of words necessary, and the number of distinct characters in each word. To reduce the number of words requisite to convey a thought, and to reduce the number of letters necessary to form a word, are the great desiderata for extending widely the uses and applications of the telegraph. In endeavouring to make a move in this direction, I have aimed at a system which does not depart much from the existing forms of our words and arrangements of sounds in their leading features, and which therefore may be easily and gradually introduced. I am aware that if a great change would be consented to, a more philosophical system might be contrived. But I have aimed at what is simple, easily learned, easily practised, and therefore a practicable innovation.

Not only do the demands of the telegraph call for a condensation of our language—the literary man and the man of business find that the mechanical process of writing occupies too much of their time, and cry out for some quicker method of putting their thoughts upon paper. The mind is restrained by the mechanical drag of the pen. The simplification and shortening that will suit the telegraph, may also be available for the penman; and some short method that will reduce very greatly both the words in the sentence and the letters in the word, seems one of the wants of the age.

Having little time and but scanty space, I proceed without further preface, to explain my plan.

It presents two principal features.

1. A system of abbreviations.

2. Dispensing altogether with certain words or grammatical forms not really required.

I. Simple Abbreviations Involving no Grammatical Change.

1. Notwithstanding the immense number of words in the English language, it will be found that the greater part of ordinary discourse is composed of a few words frequently repeated, representing common things and common ideas relating to them. Let us suppose that the telegraph can easily supply separate signs for twenty-eight letters.* Then, let each of the twenty-eight words most in use be represented by one of these twenty-eight letters;—the letters selected for each being, if possible, its initial letter, or some leading letter in it. Thus, *b* would stand for *buy; s* for *send; m* for *make; t* for *tell; h* for *have;* and so on as in paragraph 21.

2. The second abbreviation which I propose, is, for the next class of words in point of frequency of use, to substitute *two letters each*—these two letters being, if possible, the initial, and another leading letter, so that the sound of the two letters shall be a guide to the word they represent; as *gv* for *give*, *br* for *bring*, *cn* for *cannot*, *ql* for *quality*, *qn* for *quantity*, *qs* for *question*, and so on. Each of the 28 letters may thus be combined with 27 others, giving 756 combinations, which, lessened considerably for words of not more than two letters and for combinations of two letters arising from the development of the first abbreviation (1.) will leave about six hundred words in very frequent use to be represented in the telegraph by only two letters each. This, with the preceding and the derivatives, would give us short simple signs for about fifteen hundred of the words most commonly employed.

3. The days of the week and the months are of importance and frequent occurrence, and will be expressed by combinations of only two letters each.

4. For the days, the first and last letters of each are taken—except for *Sunday*, which having the same initial letter as Saturday, *l* (Lord's day) is substituted.

ly . .	Sunday.	*thy* . .	Thursday.
my . .	Monday.	*fy* . .	Friday.
ty . .	Tuesday.	*sy* . .	Saturday.
wy . .	Wednesday.		

The combination *my* is not to be used for the common word *my*—see par. 21.

5. For the months, the numeral denoting which month of the year it is, and the letter *m*, will be sufficient; meaning first month, second month, and so on.

1 *m* . .	January.	7 *m* . .	July.
2 *m* . .	February.	8 *m* . .	August.
3 *m* . .	March.	9 *m* . .	September.
4 *m* . .	April.	10 *m* . .	October.
5 *m* . .	May.	11 *m* . .	November.
6 *m* . .	June.	12 *m* . .	December.

6. Thirdly—having exhausted the combinations of two letters, we could proceed to those of three letters. By the rule of combinations, we could command 20,000 such combinations with the twenty-eight letters, and deducting several thousands for combinations flowing from the preceding, and for words of three letters, there would remain ten or twelve thousand words, which could be expressed by only three letters; and three could almost always be chosen, the combined sounds of which would be a guide to the word they represent.

7. In par. 21, I have given a list of words, which, it appears to me, would be suitable for selection, to be expressed by one letter each; and in par. 2 a few specimens of the words which might be expressed by two letters each. But I have not entered on this further than offering these as examples, as I do not think that any one individual, nor that any number of individuals, laying their heads together, can do this so well as the experience of the existing telegraph companies. I should therefore propose that a careful examination be made of the words employed in the telegraphic messsages, say for a whole year, and that the number of times each word is used be ascertained. The product of that number by the number of letters which can be saved by abbreviating the word, would show the proportionate importance of its abbreviation. Thus, if a word from which four letters can be cut off is used 100 times; and another from which only 3 letters can be saved is used 200 times, the greater saving will be effected by abbreviating the latter.

8. An examination should also be made of the comparative frequency of use of the different letters, that those most used may be represented by the simplest telegraphic signs. These investigations must be considered as at the foundation of any effective system for a shorthand for the telegraph.

9. Besides the preceding, the following abbreviations should be made: leaving out

All silent letters.

One of all double letters.

The *e* before the *d* of the past tense and past participle, before the *r* of the comparative degree, *es* before *t* of the superlative degree.

The *i* and *g* of *ing* in the present participle; the participial inflection *ing* to be represented by *n* alone; or, better still, by a separate character for the sound *ng*, if the telegraph will admit of such additional simple sign.

II. Words and Grammatical Forms to be Dispensed with.

10. Besides abbreviations, the English language may be considerably simplified by the entire rejection of certain words and inflections, which, though convenient, perhaps, in spoken language, are not at all *essential;* so that they may be entirely omitted in telegraphic communications without any loss of force or precision. I propose then, that the short-hand for the telegraph should at once dispense with the following:—

11. (1.) The Articles, *a*, *an*, and *the*. These can be spared. The Romans did without them; and the Russians do without them; and so may we in telegraphic discourse.

12. (2.) The signs of the plural, *s*, *es*, *ies*, and *ves*, whenever any accompanying word denotes plurality, as occurs in almost every case.—Thus, we should say *ten box*, not *ten boxes*. We have words in the language which take no plural form, as deer, sheep, without material inconvenience.

13. (3.) The *to* or *for* before a place to which some

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* If possible, two should be added to the present twenty-six, one for *th*, as in the Greek or Anglo-Saxon, one for *sh;* without attending to the distinction between their flat and sharp sounds.

one has gone: as *He has gone London—They set out Paris—She went Germany.*

14, (5,) Distinctions of person and number in the same tense, as *am, is, art, are,* in the present—*was* and *were* in the past of the verb "to be"—employing only one word or sign for all parts of the same tense—dispensing with the *s* at the end of the 3rd person singular of the present tense in all verbs. These distinctions are unnecessary. In the present tense of any ordinary verb, as "to write," we say I, you, we, they *write;* adding *s* for the 3d person, *he writes. He write* would do equally well; and in the 3d person of other tenses, there is no such difference—as I, you, he, she, they *wrote.*—This change, then, would cut off an *s* in every 3d pers. sing. of the present tense—a part of the verb in very frequent use, and would simplify greatly the verb "to be," that means of assertion and expression of simple existence in such constant request; retaining one sign for *am, art, is, are,* and *be;* and one sign for both *was* and *were.* It is proposed also that one form should suffice for both past tense and past participle, as is the case in all the regular verbs. This would simplify the signs for the irregular verbs, which abound among our words in common use. See par. 21.

15. (5.) The Objective Cases of the Pronouns—me, us, him, her, them, whom; the nominative case to be used instead. This is already done in our language with *you, it,* and *which,* without inconvenience; these are used indifferently for the objective or nominative case; the position before or after the verb indicating with sufficient distinctness whether they are to be regarded as subject or object. The *sound* of *he saw she,* is a little strange to the ear; but it is quite analogous to *he saw you* or *he saw it;* and if by dispensing with the objective forms of these pronouns, we can make a single and simple character suffice for twice the number of words in common use, an important end is gained for the telegraph. That there is in reality no necessity for a separate form for the objective case, is shown by the English and French nouns, which answer their purposes well without this inflection; while the common mistakes made by children and ill-educated persons as to the cases of the pronouns, unattended by any confusion as to meaning, attest the little real importance of the objective inflection. Two well known lines in Dibdin's popular songs illustrate this:

> "Sha'nt *us* go visit the island?"—and
> "If you loves *I* as I loves you."

16. (6.) The noun forms of the possessive pronouns may also be rejected—mine, ours, yours, hers, theirs—using my, our, your, her, and their, instead. This is already done with *his,* which supplies the place of both the adjective and noun forms of the possessive pronoun.

17. The possessive case will be indicated by the simple addition of an *s.* Thus, if *w* be the sign for *we* or *us, ws* will denote the possessive forms, *our* and *ours.*

18. (7.) The sign of the infinitive *to,* may also be omitted in almost every case.

19. These seven modifications may not, viewed separately, appear to be capable of effecting a great saving—but taking them all into account, there can be little doubt that they would diminish very greatly the work to be done by the telegraph.

20. If there are a few simple signs within the reach of the telegraph, they might be used for such combinations as *br, tr, cr, sl, sm, sn, st,* &c., which are of very frequent occurrence, and might be treated as simple sounds.

21. Words in Frequent Use to be Represented by *one letter each,* with their Leading Derivatives, *formed by the addition* d, n, or s.

a, am, is, are, be; (*a d,* was, were, been; *a n,* being.)
b, buy, buys; (*b d,* bought; *b n,* buying.)
c, can; (*c d,* could.)
d, do, does; (*d d,* did, done; *d n,* doing.)
e, he, him; (*es,* his.)
f, of.
g, go, goes; (*g d,* went, gone; *gn,* going.)
h, have, has; (*h d,* had; *h n,* having.)
i, I, me; (*i s,* my, mine.)
k, know, knows; (*k d,* knew, known; *k n,* knowing.)
l, lose, loses; (*l d,* lost; *l n,* losing.)
m, make, makes; (*m d,* made; *m n,* making.)
n, no, not, none.
o, on.
p, pay, pays; (*p d,* paid; *p n,* paying.)
r, write, writes; (*r d,* wrote, written; *r n,* writing.)
s, send, sends; (*s d,* sent; *s n,* sending.)
t, tell, tells; (*t d,* told; *t n,* telling.)
u, you; (*u s,* your, yours.)
w, we, us, ; (*w s,* our, ours.)
x, box, boxes.
y, yes.
th, they, them; (*th s,* their, theirs.)
sh, she, her.

Thus, at once, we provide the shortest possible symbol for each of twenty-eight of the words in most frequent use; and, as many of these have two or more words derived from them (as, *write,* wrote, written, writing,) which are also abbreviated, being expressed by one additional letter or sign, we have about seventy of the most common words reduced so that they may be expressed by extremely simple telegraphic signs. Should the telegraph, making allowance for numerals, &c., be able to supply more than twenty-eight of the simplest class of signs, we can employ these to extend the list of words of the first series, represented by only one sign.

22. It is difficult to find suitable words to be expressed by the letters *j, q, v, z.* Telegraphic returns, as suggested above, would soon show.

23. Further, there may be certain simple and easy telegraphic signs, which may be employed to express common inflections, such as those for the participles, or the possesssive case, those which transform an adjective into a noun or into an abverb, or common prefixes, affixes, as *ment, tion,* &c. By an analysis of our derivative words, methods of condensation would be found dependent on general principles in the formation of such classes of words.

24. In short, it appears to me that the conductors of the telegraphs might advantageously enter on a combined system of action for gradually simplifying and shortening their work by such abbreviations and modifications of the language as from time to time may appear to be practicable. If this were made a business and a study by one having access to the experience already acquired, the telegraph might extend its advantages so as to be within the means of all; and instead of conveying only a few dry words in urgent cases, might be made cheap enough, and simple enough, to undertake the mission of the letter, and to be employed in thousands of cases from which it is now excluded by its high cost.

25. It is not proposed that these changes should be introduced all at once. They could be taken up one by one. After two or three months' preparation telegraph operators could commence on a given day with the substitution of the *single* letter for the selected words, with the derivatives from those represented by double letters; next, after an interval, they might adopt the change in the pronouns; then the dispensing with the articles; and so on, taking up only a little at a time, and becoming expert at one series of abbreviations before going to another; printed sheets, showing every symbol, and the word it represents, to be provided for the telegraph offices.

26. To recapitulate shortly, the following changes are recommended.

1. About thirty words, those ascertained to be in most frequent use—to be represented by one letter each; their immediate derivatives, as participles, or possessive forms, to be represented by *two letters* each.

2. About *six hundred* of the words which stand next in

frequency of use, to be represented by two letters each; their derivatives, as above, by three letters.

3. Other words, of numerous letters, and frequent occurrence, to be in like manner reduced to three letters each; their derivatives to four. This to be gradually done, and extended in time to thousands of words.

4. The articles *a* or *an* and *the* to be dispensed with.

5. The *to*, sign of the infinitive, to be dispensed with.

6. One word or sign to suffice for all the six persons of the same tense.

7. The objective case of the pronoun to be dispensed with.

8. The second or noun form of the possessive pronoun to be dispensed with.

9. The preposition *to*, or *for*, before a place to which one has gone, to be dispensed with.

10. The plural signs, in almost every case, to be dispensed with.

11. The past and present participles, possessive forms of the noun, comparative and superlative degress of the adjective, to be represented by the addition, respectively, to their primaries, of only one letter each—*d, n, s, r, t*, or some still simpler telegraphic sign.

12. All silent letters, and one of all double letters, to be omitted.

13. In many long words, for which symbols have not been appropriated, the vowels to be omitted.

My object on the present occasion is more to show that much might be done, than to recommend dogmatically any particular system. It is probable that a more minute examination of the subject would develope further abbreviations. But I think enough has been said to lead to the presumption that, after a thorough examination of the telegraphic messages for a considerable time, to ascertain the most frequently used words and letters, and a careful analysis of the language to distinguish what is *essential* from what is *accidental* in character, as well as to take advantage of general laws of structure on which simplifications may be founded, some scheme might be devised which would enable us to reduce very greatly the work required for telegraphic operations—probably to *one-third or one-fourth* of its present amount.

Proceedings of Institutions.

Burton-on-Trent.—The report of the Committee of the Literary Society, read at the general meeting, July 15th, states that the progress of the Society during the past year has been favourable. Notwithstanding the large outlay which has been made in the purchase of books and furniture for the news-room, the statement of account, annexed to the report, shows an increase on the balance carried forward last year, and the committee have no doubt that, with judicious management, this highly satisfactory position may not only be maintained, but improved. The committee had long felt that the valuable and rapidly increasing library belonging to the Society was, owing to the few opportunities there were of obtaining books, practically closed to many of its members; but until the finances of the Society were brought into their present prosperous state, they could not recommend the outlay requisite for the salary of a librarian in constant attendance. This difficulty having, however, been removed, the much desired alteration has been effected, and the committee have little doubt that it will be beneficial to the Society in a pecuniary point of view, as well as to the advantage of the members personally. £61 6s. 11½d. have been expended in the purchase of books during the past year, and a further addition will immediately be made to the library, which now bids fair to take a leading position amongst the other libraries of the town. A new catalogue, entirely re-arranged, is being prepared, and will shortly be ready for issue. The committee congratulate the members on the success which attended the lectures delivered during the last season. Great expense was incurred to secure the services of efficient lecturers; nevertheless, a profit of £38 13s. 9d. arose from this source alone. Encouraged by this success, the Committee will immediately enter into arrangements for a course of lectures and entertainments for the ensuing season, and will spare no trouble or expense to render them more attractive than those of any former season.

Cambridge.—At the annual meeting of the Mechanics' Institute, held on 29th June, a handsome testimonial, consisting of a chastely-manufactured silver inkstand, was presented to Mr. Harris, in recognition of his services as one of the honorary secretaries, he having fulfilled the duties of that office from the establishment of the Society upwards of twenty-two years since. The testimonial bore the following inscription:—"Presented by the members of the Cambridge Mechanics' Institute to their Honorary Secretary, Henry Hemington Harris, Esq., June, 1857."

Chatham, Rochester, Brompton, and Strood.—In presenting the twentieth annual report of the Rochester and Chatham Mechanics' Institution, the committee commence by heartily congratulating the members and friends upon the great progress which it has made during the past year, which has been, indeed, a most important one in the history of the institution. At the commencement, it appeared fast sinking beneath the decrepitude of age, bowed down under a weighty load of debt, and tottering upon the verge of extinction. Each quarter exhibited a sad diminution in the number of its members, while its liabilities were, of course, correspondingly increasing, until at length it was deemed by many to be no longer advisable to attempt to prolong the existence of an institution which, to all appearance, was doomed to a speedy and unfortunate end. Under these circumstances, a meeting of the members was convened in July of last year, when various plans were submitted for its dissolution, remodelling, and continuance. It was at length, however, resolved that an energetic attempt should be made to rescue the Institution from the difficulties which surrounded it, and to re-establish it upon an improved and more enduring basis. An appeal was made to the inhabitants of the towns for pecuniary aid, an appeal most generously responded to, and, by means of which, the committee were placed in possession of funds, not only sufficient to extinguish the debt, which had so long impeded the progress of the Institution, but also to enable them thoroughly to refit the Institute itself. The actual results of the year may be summed up as follows:—A debt of nearly £70 entirely liquidated. A considerable addition to the number of the members. A great improvement in the internal arrangement of the Institution, and in the class of lectures and entertainments provided for the instruction and amusement of the members. Besides which, a more general feeling of interest in the success of the Institution has been excited amongst the inhabitants of the towns, many of the most influential of them having become members. The committee call particular attention to the important services rendered to this Institution by one of its Vice-Presidents, Mr. Joseph Pyke. The library is not, as yet, in the condition in which the committee soon hope to see it; but they trust, however, that the balance which they hope to be in possession of at the close of the present quarter, will enable them to make some extensive additions to this most important branch of the appliances of the Institution; the issues from which, during the past unfavourable year, have amounted to 9,000. The committee still labours under a long felt disadvantage in the want of a suitable room for the delivery of the lectures given in connection with this Institution. During the past year, they have occasionally hired the Rochester Corn Exchange for the use of some of the more popular lecturers, and during the present quarter they have been again compelled repeatedly to make use of it. They are happy, however, in being able to state that notwithstanding the distance and other inconveniences attaching to the Corn Exchange, the attendance has, on all occasions, been of the most satisfactory and encouraging nature. They will eagerly embrace the first opportunity which presents itself, enabling them to supply the members with a lecture-hall suitable to the requirements of the towns, and capable of accommodating the rapidly increasing audiences. Instead of being open, as hitherto, only during the evening of each day, admission can now be obtained at any hour between 10 o'clock in the morning and 10 o'clock at night; the librarian being constantly in attendance to exchange books, and furnish any information which may be required. The news-room has been incorporated with the Institution, so that members will now find, upon the morning of publication, the leading daily papers in the reading-room. The discussion class still continues in operation, and the committee would earnestly request every member of the Institution to use his or her influence in promoting this most useful and instructive undertaking.

Royal Polytechnic Institution.—On the 25th July an interesting ceremonial took place at this Institution in the public presentation of the certificates of merit awarded by the Society of Arts to 44 students of the class formed last year for instruction in various branches of knowledge who had passed with success the examination prescribed by the Society. A meeting for the purpose, of persons interested in the promotion of education, was held in the large lecture-room, under the presidency of Viscount Ebrington, M.P. The noble lord was supported by J. H. Pepper, Esq., Rev. Dr. Booth, Dr. White, Dr. Sayer, Dr. Leslie, Mr. Buckmaster, Mr. Ure, and other friends of the educational movement. His lordship opened the proceedings with an address, which he commenced by observing that he had accepted the honour of being in the position he then occupied more for the purpose of showing his unabated sympathy and interest in the excellent institution within whose walls they were met, than with any hope of rendering much service to the cause. Education was the subject in which he was more deeply interested than any other. He had only diverged into the question of sanitary reform because he had seen how often the lessons of school were neutralised by the influences of home. At the recent meeting on education at Willis's Rooms, the results of the experiences there brought forward led them to feel how little net gain had attended the most carefully prepared and best adjusted projects. But he thought, with respect to this institution, they might congratulate themselves that the gain was entirely net. He could not see a single drawback in the good effected by such classes as they had there, attended with examinations. Lectures ought to be regarded rather as the caviare to stimulate the appetite for knowledge than the food to satisfy it. In that Institution they had a most successful example of the working of a system of classes. The industry and perseverance of the students had been tested by a most severe examination, from which they had come out abundantly triumphant. Upwards of 400 students had attended the classes during the last session, and that number was now increased to 600. Fifty-three went in for examination, and 44 of them obtained certificates of merit, or nearly 19-20ths of the whole. If the system of examinations, which, by the aid of the Society of Arts, honourably and usefully followed by the universities, had been extended to the middle classes, should have the effect he believed it would, of engrafting upon the business qualifications of Englishmen the appreciation of learning and literature that characterised the Germans, he thought the pre-eminence of this country would be placed on the soundest basis. His lordship concluded by thanking them for the patience with which they had received his unprepared remarks. The successful students were then separately called forward to the platform, and each received from the noble chairman his certificate, the presentation being accompanied by a few graceful words of congratulation. There were fourteen certificates for arithmetic, nine chemistry, four French, four book-keeping, three geometry, two algebra, two mensuration, one political economy, and one electricity. Two of the professors—Mr. Buckmaster, of the chemistry class, and Dr. White, of the arithmetic and algebra classes—were then presented with votes of thanks, written on vellum and framed, from their respective pupils; and they severally acknowledged the compliment. Subsequently a series of resolutions, commendatory of the system of classes established at the Polytechnic, and of the examinations instituted by the Society of Arts, were proposed and adopted, the meeting being addressed by Dr. White, Dr. Leslie, Dr. Booth, Mr. Buckmaster, Mr. Pepper, &c., &c. A vote of thanks to the chairman closed the proceedings.

Wenlock.—The members of the Olympic class, connected with the Agricultural Reading Society, met on Wednesday morning, the 5th inst., at 9 o'clock, and proceeded in procession to the racecourse, where the men engaged in games of quoits, leaping heights and distances, foot races, &c., for which prizes varying from a few shillings to a sovereign were given. The afternoon's sports consisted of hurdle racing, foot racing, donkey racing, a jingling match, a wheelbarrow race, and climbing the pole. At about five o'clock, the Rev. Mr. Hayward distributed the book prizes to the children who were successful in the industrial and intellectual competition, in which an examination had been recently held. The books were handsomely bound and illustrated, and were mostly on useful and entertaining subjects. The presentation of the books was accompanied by some seasonable advice to the recipients. The games having been ended, the procession re-formed, and, upon reaching the hall, three cheers were given for Mr. W. P. Brookes, who thanked them for this expression of kind feeling. He congratulated them on the innocent recreation which those meetings afforded to many whose lives were spent in toil; and on the good this class was effecting in an educational point of view. They were all, doubtless, aware that one of the questions which at present engaged the earnest attention of some of the wisest and best of our public men was the education of the people, and they must all feel that it was a most important one on account of the influence it would have on the happiness and prosperity of the nation. But as the term education, according to its popular acceptation, was very commonly understood as having reference exclusively to the mind, was there not reason to fear that, whilst attending to those branches which were unquestionably of the highest moment, viz., the culture of the religious, moral, and intellectual faculties, the bodily training of the people would be entirely overlooked? Were not the children at many of our public schools already too much confined? He thought they did not afford to the young men of their towns and villages sufficient facilities for those manly exercises which helped to strengthen the dwelling place of the mind, and those bodily instruments which executed its mandates. He thought that England should not neglect any precaution, however humble, that might be calculated to add to the stability of her empire; and the bodily training of her youth was of the utmost importance. But the Wenlock Olympic class was instituted, not for athletic exercises only, but for the encouragement of useful, industrial, and intellectual attainments. They had not been unmindful of these objects, but had marked their estimate of the value of a common sound English education for both sexes of the labouring classes, by the announcement of appropriate prizes for knitting, plain sewing, writing, reading, spelling, arithmetic, and Bible and English history. There had also been an additional prize this year for drawing, the encouragement of which, he thought, would be of great advantage. The prizes distributed were small, but their utility and value would be much increased if the children would read attentively their books, and the young men would place their money prizes in the savings bank, and endeavour to add to the amount, from time to time, such small sums as they migh be able to spare out of their weekly earnings. Dancing then commenced under the hall, and was kept up for several hours.

PARLIAMENTARY REPORTS.

SESSIONAL PRINTED PAPERS.

PAR. NO.

Delivered on August 4th.

162. Portpatrick and Donaghadee Harbours—Copy.
207. Fines and Penalties (Ireland)—Abstract of Accounts.
218. Duchy of Lancaster (Bertolacci's Petition)—Report.
223. Military Education—1st Report of the Council.
170. Bill—Dulwich College (as amended by the Select Committee).
Cotton (Africa)—Papers relating to the Cultivation.

Delivered on August 5th.

185. Rochdale Election Petition—Minutes of Evidence.
198. Police (Bengal Presidency)—Return.
228. Army—Supplementary Estimate.
233. Metropolitan Drainage—Return.
173. Bills—Dunbar Harbour Loan (Scotland).
174. ——— Summary Proceedings before Justices of the Peace (amended).
Army (War Medals presented by the King of Sardinia)—List of Officers, Non-commissioned Officers, and Men, selected to receive the Medals.
Sewage of Towns (Deodorizing and Utilizing)—Report.
National Gallery Site—Report of the Commissioners.

Delivered on August 6th.

221. Freight Money (Greenwich Hospital)—Return.
222. Dulwich College Bill—Minutes of Evidence.
237. Colonial Governors, &c.—Return.
241. Rating of Mines—Report from the Committee.
171. Bills—Probates and Letters of Administration (Ireland) (amended).
176. ——— Insurance Companies (amended in Committee and on re-commitment).
175. ——— Probates and Letters of Administration (amended in Committee and on re-commitment).
177. ——— Ecclesiastical Commission (amended by the Select Committee and on re-commitment).

Delivered on August 7th.

77. (A 1) Poor Rates and Pauperism—Return.
214. Statute Law Commission—Return.
215. East India (Area, Population, &c.)—Return.
229. Vancouver's Island—Copies of Despatches.
230. Bank of Australasia—Copy of the Charter.

Delivered on August 8th and 10th.

186. Maidstone Election Petition—Minutes of Evidence.
243. Beverley Election Petition—Minutes of Evidence.
216. Coast Guard—Return.
225. Indian Territories Committee (1853)—Petition of the Hindoo Inhabitants of Bengal, &c.
232. Major-General Beatson—Return.
238. Emigration Commissioners—Returns.
244. Army Prize Money—Account.
245. Gold Coast—Return.
247. Indian Army—Extract from Sir C. J. Napier's Letter to the Duke of Wellington.
251. Metropolitan Improvements—Return.
175. Bills—Probates and Letters of Administration (a corrected leaf).
182. ——— Parochial Schoolmasters (Scotland).
181. ——— Reformatory Schools—Lords Amendments.
India (Mutinies in the East Indies)—Supplement to the Papers presented July, 1857.
India (Mutinies in the East Indies)—Appendix to Papers.

PATENT LAW AMENDMENT ACT.

APPLICATIONS FOR PATENTS AND PROTECTION ALLOWED.

[*From Gazette, August* 7.]

Dated 11*th May*, 1857.

1328. Collinson Hall, Knavestock, Essex, and Thomas Charlton, Brentwood—Improvement in agricultural engines and implements used therewith for ploughing and cultivating the soil.

Dated 22*nd May*, 1857.

1442. Bernhard Samuelson, Braffords-house, near Brough, Yorkshire—Improvements in safety apparatus for giving artificial light.

Dated 11*th June*, 1857.

1642. Joseph Michell Paule, Alston, Cumberland—Improved means for ventilating coal and other mines.

Dated 16*th June*, 1857.

1682. John Fowler, junr., Cornhill, and William Worby, Ipswich—Improvements in ploughing or tilling land.

Dated 17*th June*, 1857.

1694. James Heywood Whitehead, Southside, Saddleworth, Yorkshire—Improvements in pressing cloth.

Dated 18*th June*, 1857.

1706. John Everard Barton, Kidderminster—An improvement in winding worsted on to creel bobbins of carpet looms.

Dated 20*th June*, 1857.

1728. Benjamin Richardson, Wordsley, near Stourbridge—Improvements in manufacturing and ornamenting articles of flint glass.

Dated 22*nd June*, 1857.

1744. Christopher Dicran Seropyan, Newhaven, Connecticut, U.S.—A mode of preparing bank notes, bills of exchange, and other papers, to prevent counterfeiting, by photography and its kindred processes.

Dated 24*th June*, 1857.

1764. George Ireland, Birmingham, Warwickshire—Improvements in raising weights, applicable to stamping or cutting metals and other similar purposes.

Dated 1*st July*, 1857.

1836. George Murray, Glasgow—Improvements in machinery or apparatus for propelling ships and vessels.

Dated 11*th July*, 1857.

1932. William Thomas Smith and Frederick Talbot, Birmingham—An improvement or improvements in hair pins.
1934. John Loach, James Jones Salt, and Burton Day, Birmingham—Certain improvements in metallic air-tight coffins, as also in the mode of covering, finishing, and ornamenting such like coffins.
1936. Peter Armand le Comte de Fontainemoreau, 39, Rue de l'Echiquier, Paris—An improved shoe or boot scraper or cleaner. (A communication.)

Dated 13*th July*, 1857.

1940. Murdoch McKay and Henry Forfar Osman, 33, Essex-street, Strand—Improvements in apparatus for securing the points of railway switches.
1942. Joseph Lester Hinks, and John Rock Day, Birmingham—Improvements in locks and latches, and in attaching lock and latch knobs to spindles.
1944. Peter Rector Smith, New York, U.S.—Improvements in fire-arms and ordnance.
1946. William Edward Newton, 66, Chancery-lane—Improved machinery for converting old rope or cordage into tow. (A communication.)
1948. William Edward Newton, 66, Chancery-lane—An improved construction of portable railway for steam traction engines on common roads or land. (A communication.)

Dated 20*th July*, 1857.

1999. Hugh Smith, Porchester-square—An improved agricultural implement for pulverizing and cleansing land.

WEEKLY LIST OF PATENTS SEALED.

August 7th.

368. Henry Cartwright.
377. William Thomas Walker.
381. Benjamin Webster Owrid.
382. Joseph Graham, James Shepherd, and Thomas Whitaker.
385. Austin Chambers and William Harrison Champion.
386. George Bedson.
392. Abraham Royds and John Kenyon.
400. William Todd and Jacob Todd.
402. Richard Dugdale Kay.
404. John Macintosh.
419. George Gimson.
472. Jacob Green.
476. Julien Blanc.
543. John Henry Johnson.
549. James Fenton.
556. John Henry Johnson.
570. Victor Cassaignes.
575. William Robertson, James Guthrie Orchar, and John Menzies.
626. William Edward Newton.
870. Domenico Tomasini.
1042. Rd. Archibald Brooman.
1053. Rd. Archibald Brooman.
1272. Henry Elliott Hoole.
1286. Peter Armand le Comte de Fontainemoreau.
1404. Edward Alfred Cowper.
1446. John Turner Wright and Edwin Payton Wright.

August 7th.

406. George Chappell Potts.

August 11th.

398. John Talbot Pitman.
403. John Poole.
424. William Richardson.
426. D. A. Lamb.
430. Marmaduke William Hallett.
442. Archibald Smith.
443. James Taylor.
450. Thomas Newcomb.
455. William Clark.
456. Thomas Ball.
463. Emile Alcan.
499. John Combe.
509. Francis Hay Thomson.
531. Jacques Henri Marie Maissiat.
561. Thomas George Shaw.
566. Chas. Bruton, senr., Chas. Bruton, jun., Francis Jas. Bruton, and Samuel Rogers Bruton.
568. William Mills.
636. William Edward Newton.
639. George Walter Dyson.
680. James Andrew Cumine and Colin Hunter.
688. William Edward Newton.
1320. Charles William Siemens.
1528. Dr. Hermann Bleibtreu.
1578. Robert Hanham Collyer, M.D.
1598. Amory Fairbanks Sherman.
1602. John Brown.
1658. Thomas Turner.

PATENTS ON WHICH THE STAMP DUTY OF £50 HAS BEEN PAID.

August 3rd.

1947. Joseph Westwood and Robert Baillie.

August 4th.

1735. Henry Turner.
1748. John Livesey.

August 5th.

1720. John Cunningham.
1725. George Addison Cox.
1775. John Greaves and Charles Michael Greaves.

August 7th.

1766. John Petrie, jun.
1807. John Pretty Clarke.
1817. Edward Lund.
1832. Robert Brisco.

August 8th.

1750. William Houghton Clabburn.
1755. Peniston Grosvenor Greville.

Journal of the Society of Arts.

FRIDAY, AUGUST 21, 1857.

MEASURES, WEIGHTS AND MONEY.

The following is the substance of a pamphlet lately published by Lieut. General Sir C. W. Pasley, K.C.B., F.R.S., &c., who, it may be premised has a special claim to be listened to on this subject, as he was one of the first to draw public attention to the inconveniences of our present system, and to suggest some practical remedy. In the present paper he begins by stating that, in consequence of an order given by the Duke of Wellington, as Master-General of the Ordnance, in 1825, that practical architecture should form part of the course of instruction of the junior officers attending the Royal Engineer Establishment at Chatham, under his direction, he was induced to enter into the details of measuring and estimating buildings and other works himself, and in this inquiry he says that he soon found that the rules for measuring and estimating every description of artificers' and labourers' work were embarrassed by unnecessary and even absurd difficulties, arising partly from the complexity of our national measures and weights, and partly from the nature of our coinage, in both of which, decimal are intermixed with duodecimal and binary subdivisions of the discordant units, assumed for measuring and pricing workmanship and materials. In the hope of obviating these difficulties, after having paid great attention to the subject for several years, he published a small volume, in the year 1834, entitled *Observations on the Expediency and Practicability of simplifying and improving the Measures, Weights, and Money used in this Country, without materially altering the present Standards;* in which he proposed an entire revision and reform of the whole of these standards without exception.

In 1847, Sir Charles Pasley presented a paper containing an abstract of his plan of improvement to the British Association at Oxford, which was published in the *Transactions of the Sections* of that year, page 43; and, in 1855, a similar paper, with improvements, was drawn up by him, and the substance of it read and discussed at the meeting of the Association at Glasgow. The present paper contains the final result of his researches and reflections on this important subject, in which he says he has taken the greatest interest for the third part of a century.

I. General Table of New Lineal Measures Proposed.

10 tenth parts	1 imperial inch.
10 imperial inches, or 100 parts	1 foot.
3 feet	1 yard.
6 feet	1 fathom.
1,000 fathoms	1 mile.
60 miles	1 degree of the terrestrial meridian.

For Architectural and Mechanical Purposes.

10 tenth parts	1 imperial inch.
10 imperial inches	1 foot.

For Cloth Measure.

2 half-tenths	1 tenth of a yard.
2½ tenths	1 quarter.
5 tenths	1 half.
7½ tenths	3 quarters.
10 tenths	1 yard.

For Itinerary Measure.

10 links	1 fathom.
100 links	1 chain of 10 fathoms.
100 chains, or 1,000 fathoms	1 mile.

Measures of Temperature and Air.

The Centigrade Thermometer, generally used in France and other countries, having its zero at the freezing point—the only invariable point of temperature in nature—and its one hundredth degree determined by the temperature of boiling water, when the barometer stands at 24¼ inches of the new lineal measure, is proposed to be adopted in preference to Fahrenheit's scale. The barometer to be marked in inches and tenths of the new measure.

The new standard of lineal measure to be the fathom of 6 feet, marked on a rod of brass or other metal, and made equal to 6 feet 0·91548 inch in our present measure, at the temperature of 62·6 degrees of Fahrenheit, or 17 degrees of the Centigrade Thermometer. This proportion will make the proposed mile equal to 1012·715 fathoms of our present measure, being the mean length of the minute of a degree of a terrestrial meridian, according to Mr. Airy's treatise on the figure of the earth in the *Enclopædia Metropolitana*. Should more extensive surveys of meridional arcs, since made or in progress, lead to a more accurate value of the said minute, it is proposed that the necessary correction shall be effected, not by changing the standard rod, but by altering the legal temperature to a higher or lower point than 62·6 degrees of Fahrenheit.

For measuring works of architecture and engineering, the foot and its decimal subdivisions will be the unit, without reference to the fathom; and all workmanship measured by lineal measure must be priced by the foot, the 10 feet, or the 100 feet, not by the yard or rod.

For Itinerary measure, or land surveying, the fathom will be the unit, without reference to the foot. The mile will be the nautical or geographical mile, the only universal measure recognized by all civilized nations. The proposed new fathom and foot will differ so little from our present standards—only by one eightieth part of the latter in excess—that, supposing the two fathoms to be set up at some little distance apart, no person standing between them, and who consequently could not see both at the same time, would be able, after having looked at both, to say which of the two was the shortest.

II. New Square or Superficial Measure Proposed

For Architectural and Mechanical Purposes.

All work now measured by the superficial foot to be priced in future by the square foot, by the 10 square feet, or by the 100 square feet, and not by the square yard or rod.

For Cloth Measure.

Cloth to be priced by the new imperial yard, in the same manner as is now done by the present standard yard.

For Land Measure.

100 square links	1 square fathom.
1,000 square fathoms	1 imperial acre.
1,000 imperial acres	1 square mile.

III. New Measures of Solidity and Capacity Proposed.

Of Solidity for Architectural or Mechanical Purposes.

1,000 cubic inches	1 cubic foot.

For Wholesale Dealings.

100 cubic inches	1 can.
10 cans, or 1000 cubic inches	1 cubic foot.
10 cubic feet	1 quarter of corn.

For Retail Dealings exclusively.

2 gills, or 10 cubic inches	1 half-pint or chopin.
2 chopins	1 pint.
2 pints	1 quart.
2½ quarts, or 5 pints	1 can.

Thus the cubic foot will be divided into 10 cans, 25 quarts, 50 pints, 100 chopins, and 200 gills. The new names *Can* and *Chopin* are recommended to designate the tenth and the hundredth parts of the cubic foot respectively, being its most important subdivisions. The latter is a Scotch as well as a French word.

In measuring corn for wholesale dealings, as well as sand, lime, &c., it is proposed to use measures of one cubic foot and of five cubic feet, open at the top and bottom, to be laid upon a level floor. Two of the latter to be put together one above the other and form a 10-cubic-feet measure.

Beer, wine, and other liquors, to be priced and gauged, and the duties collected by the cubic foot. In retail dealings, they should be sold by the ten bottles instead of the dozen, and each bottle should contain a quart or pint.

New Apothecaries' Liquid Measure Proposed.

50 minims..............	1 tenth of an imperial cubic inch.
500 minims or 10 tenths	1 cubic inch.
10 cubic inches	1 half-pint, or chopin.

This will differ so very little from the present apothecaries' liquid measure, that no medical practitioner can hesitate in adopting it.

IV. New Measures of Weight Proposed.

10 tenth parts...........	1 imperial ounce.
10 ounces	1 imperial pound.
100 pounds	1 hundredweight.
1,000 pounds	1 thousandweight.
2,000 pounds	1 imperial ton.

For Retail Dealings exclusively.

2½ tenths..............	1 quarter	of an imperial ounce.
5 tenths..............	1 half	
7½ tenths..............	3 quarters	

For Coins, Bullion, &c., and for Apothecaries' Weight.

10 hundredth parts of a grain...	1 tenth part.
10 tenth parts	1 grain.
1,000 grains	1 imperial ounce.

The standard one-pound weight to be exactly one-sixtieth part of the weight of the new cubic foot of distilled water, as ascertained by brass weights, at the temperature of 17 degrees of the centesimal thermometer, or 62·6 degrees of Fahrenheit, with the barometer standing at 24½ inches of the new lineal measure. By this arrangement, 100 lbs. of the new will be charged to about 108 lbs. of the present avoirdupois weight.

All goods sold now by avoirdupois weight to be priced in future by the imperial pound and its decimal multiples, the 10 lbs., the 100 lbs., and the 1,000 lbs., to the exclusion of stones, quarters, hundredweights, and tons of our present avoirdupois weight. For retail purposes the new ounce and its tenth parts to be used. The grain, being subdivided into tenths and hundredths for very delicate purposes, and its decimal multiples the 10 grains, the 100 grains, and the 1,000 grains or imperial ounce, will be used exclusively for weighing and pricing all valuable articles to which Troy weight is now applied, and to the entire exclusion also of pearl weight, diamond weight, and all the carat weights. For apothecaries' weight, to which it is also applied in preparing medical prescriptions, and which requires the use of the grain as well as of the ounce, the difference between the present and the proposed new grain and imperial ounce is not worth noticing.

Barrels and casks of various denominations, as well as sieves, baskets, sacks, boxes, and other packages, now designating special quantities or weights of beer, wine, fruit, corn, and other goods, together with the various customary loads, lasts, and weys, all differing from each other, not to be used as measures or weights, without specifying the contents or the amounts of each, in cubic feet or pounds weight, as may be.

If the foregoing suggestions, or any system on the same principle, for simplifying our national measures and weights, should be adopted, the fine idea generally supposed to have been intended in Magna Charta, and most clearly and unequivocally expressed in one of our ancient laws of a subsequent date, but which has never yet been realised in this country, will be literally accomplished, namely, that THERE SHALL BE ONLY ONE MEASURE AND ONE WEIGHT THROUGHOUT ALL THE LAND.*

V. New Monetary System Proposed.

10 farthings..	1 cent.
10 cents, or 100 farthings	1 florin.
10 florins, 100 cents, or 1,000 farthings	1 pound stg.

Setting aside all the new coins proposed by him in his first publication of 1834, except the tenth of the pound, since called the florin, and the silver cent—and setting aside also his attempt to simplify the monetary system therein proposed, in the paper read to the British Association at Oxford, in 1847, which, he admits, was by no means an improvement, Sir Charles Pasley is now of opinion that the only new coin that ought to be issued is the silver cent, and that no silver coin greater than the florin should be coined in future, gradually withdrawing all the crowns and half-crowns still in circulation, as soon as florins to an equal amount can be issued from the Mint to replace them.

When any sum of money of the new coinage is written in sterling money, the last figure or unit of the pound should always terminate in a point, after which the next three figures will designate florins, cents, and farthings, whether having these denominations marked over them or not; but more or less than three such figures must never be used.

He is also of the opinion, now adopted by the Council of the Decimal Association, of which he is a member, that instead of coining new copper mils, or tithings, as he called them at first, it will be much better to declare by royal proclamation that the farthing shall be the tenth part of the cent, and the thousandth part of the pound, or to make it so by Act of Parliament; but it does not appear to me to be necessary to withdraw any of the smaller silver coins, such as the threepenny and fourpenny silver pieces, which, though not known when he first published on this subject, have been a very great convenience to the public, and which none of the working classes ever mistake for one another, even in the dark, nor will they confound any of them with the new silver cent proposed.

This coin should be stamped with the word ONE CENT OR 10 FARTHINGS. The present sixpenny pieces need not be called in; but when more are required, let them be stamped with the words ONE HALF-SHILLING. In like manner, when more of the present fourpenny pieces are required, let them be stamped ONE-THIRD OF A SHILLING; and when more of the present threepenny pieces are required, let them be stamped ONE-FOURTH OF A SHILLING. To add anything more would be superfluous.

VI. Difficulties urged as Objections to the Decimal Coinage Proposed: their Groundlessness.

1st. *The great Length of Time necessary for carrying it into Effect.*

This difficulty has only arisen from the supposed necessity of "substituting a purely decimal money for that already in circulation, in which each silver and copper piece shall carry marked on it its decimal value, the pound being unity." But when we consider that after the first sovereigns were coined, there were no less than five gold coins in circulation—the guinea, the half-guinea, the third of a guinea, or seven-shilling piece, the sovereign, and the half-sovereign; and that at the same time there were four silver coins—the crown, the half-crown, the shilling, and the half-shilling; and three copper coins—the penny piece, the halfpenny piece, and the farthing—none of which were stamped either with their name or value, and yet every person knew the names and value of the whole of them, the above tedious and expensive process, calculated as the work of twenty years, must be allowed to be perfectly useless.

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* See the tenth chapter of an Act of the 27th of Edward the Third, entitled "*Ordinacio Stapularum*," in the "Statutes of the Realm," vol. I., page 337.

2nd. *The Supposed Injury that will be done to the Working Classes by depreciating the Value of the Copper Coinage.*

The worst-paid agricultural labourers in this country are always paid their week's wages in silver; and even if paid by the day, silver must form a part of their payment, the copper merely being the change. Hence, instead of losing, the poor man will gain, because with every shilling he will be able to buy twelvepence halfpenny, and with every half-shilling or silver sixpenny piece he will be able to buy sixpence farthing.

3rd. *The question of Penny Tolls.*

The difficulty attending this question may be got rid of by the following very simple arrangement:—

Supposing that a toll of one penny is due for passing a certain gate all the year round, Sundays included, and that a farmer or other person is obliged by his business to pass through it every day in the year, the charge for one year would be thirty shillings and fivepence of our present currency.

After the value of the present copper coinage shall be depreciated, let the turnpike-man charge one penny for every day in the year, excepting on the 5th, 10th, 15th, 20th, and 25th days of every month, on which he is to be allowed to charge one penny farthing.

Hence there will be 305 days in the year charged at 4 farthings, amounting to	1,220 farthings,
and 60 days in the year charged at 5 farthings amounting to	300 ,,
Total	1,520 farthings,

Since the farthing will now have become the one thousandth part of the pound sterling, 1,500 farthings will be equal to 30 shillings, with 20 farthings or 5 pence over, and thus the amount he receives from the passengers will be the same as before.

VII. Advantages of the New System of Measures, Weights, and Money Proposed.

In the first place, the mile proposed, being the nautical or geographical mile, used exclusively for the purposes of navigation by all the maritime nations of the world, not excepting the French, and inserted in the scales not only of charts, but also of the maps of all countries, in addition to scales of the customary leagues, miles, or other itinerary measures of those countries, is already a universal measure, and the only one now recognised in every part of the globe. Hence, if the governments of all civilised nations should hereafter appoint competent commissioners to assemble and report upon the best universal standards of measures and of weight, to be adopted by common consent of all, the fathom or toise, and the foot derived from the proposed mile, might justly claim the preference, because the latter differs so little from the former foot of France, and from the present foot of all other countries, that it would not cause any embarrassment to practical men, nor any more confusion than the substitution of the imperial gallon for the former ale and beer gallon has done in this country: that is, little or none. The same remark applies to the standard pound weight, derived from the proposed cubic foot, which in like manner differs so little from the former French pound weight, and from the present pound weights of other countries, that no embarrassment or confusion could be created by adopting it.

By the new system proposed, a simplicity and precision will be given to measures of distance and of area on the surface of the globe, of which our present standards afford no criterion. For example: nobody knows or can even guess how many rods or yards there are in a given number of statute miles, nor how many acres or square rods there are in a given number of square miles of our present measure, which can only be ascertained by very troublesome calculations; but 173 miles of the new measure would be known at once to be 173,000 fathoms, and 248 square miles to be equal to 248,000 imperial acres, or to 248 million square fathoms.

In like manner, though no one can even guess how many cubic feet a given number of gallons of our present standard measure of capacity are equal to, or *vice versâ*, this embarrassing uncertainty, and the necessity of very troublesome calculations in order to compare those two denominations together, will be avoided by establishing the cubic foot as the only standard both of solidity and capacity.

In buildings and other works of architecture, engineering, &c., which are always measured by the foot, the necessity of computing artificers' and labourers' work, as well as materials, duodecimally—and, in goods sold by weight, the troublesome reduction of tons into cwts., quarters, and pounds, and *vice versâ*—and in all accounts the reduction of pounds sterling into shillings, pence, and farthings, and *vice versâ*— will also be avoided, which will be an immense saving of time, trouble, and risk of error.

The author states that after a very careful investigation of the history of our national weights and measures, from the time of Alfred to the present day, he has ascertained that, with the exception of our lineal measure, none of our present standards are venerable from their antiquity, as might naturally be supposed by those who have not had the means of such investigation; they having, on the contrary, been subject to much greater changes than those which he now proposes, and all those changes having originated from accident, error, bad workmanship, or neglect, (with the exception of the establishment of the imperial gallon in 1824), which, strange to say, was the first and only modification of our existing standards, adopted systematically, as an improvement and with a view to the public benefit, in the course of 800 years. Such as they were, however, even the legal standards were disregarded in every part of the kingdom, where such an immense number of incongruous and discordant local measures and weights prevailed, differing from those standards and from each other, and of necessity producing the greatest confusion.

The author then proceeds to consider the objections to the French metrical system. He is of opinion that it has proved an entire failure as regards astronomy and navigation, and that, instead of producing uniformity, it has caused greater confusion in the weights and measures of France than ever prevailed before. Though planned by some of the most eminent astronomers of France, the master mariners as well as the seamen of that country rejected from the first the decimal divisions of time and of the circle, as well as the decimal degrees of the quadrant of the terrestrial meridian of 100,000 metres or 10 myriametres each, and the decimal minutes of the meridian of 10,000 metres or 10 kilometres each; and the French pilots rejected with disdain the smaller decimal parts of the same measures for the length of their log lines, as well as the decimal division of the horizon into 40 rhumbs instead of the 32 points of the compass; and it is only within the last few years that the French have begun to take their soundings by metres.

It is strange, that it never occurred to the celebrated astronomers, who decided upon the decimal divisions of time, and of the circle, and of the terrestrial meridian, that it was an absolute impossibility to introduce the first, until all the watches and clocks of France were replaced by time-pieces according to the new system; or the latter, until all the naval charts and maps in possession of the mariners and geographers of France were replaced by new ones, graduated according to the decimal system; and, what is more, until all other nations adopted the same decimal metrical system that they proposed, and also took the steps absolutely necessary for carrying these sweeping changes into effect, by condemning all their old times-pieces, charts, and maps, and having new ones made. For astronomical tables nothing could be more injudicious than the decimal metrical system, because the diurnal rotation of the earth on its axis, and its annual revolution round the sun, as well as the motions of the moon, its satellite, and those of the other planets and their satellites, composing the solar system, when compared together in their respective orbits, the lesser to the greater, as aliquot parts or multiples of one another, in any possible order of combination, involve the most complex fractions or mixed numbers, of which the fractional parts, when expressed decimally, run on *ad infinitum;* whereas the ordinary divisions of time, and the sexagesimal divisions of the circle and of the terrestrial meridian, approximate much more nearly to the motions of the heavenly bodies, and are, therefore, far better adapted for astronomical calculations.

The new decimal metrical system, as applied to weights and measures, was almost equally inoperative; for, excepting in the collection of duties and other transactions, to which the Government was a party, and in all written agreements, relating to wholesale commercial transactions, in which it was rendered imperative by law, the *Metres*, *Ares*, *Litres*, *Steres*, and *Grammes*, which are the units of that system, with their Latin and Greek prefixes, occasioned so much confusion, that they were never used at all during the Republic, the Consulate, and the first year of the Empire, being perfectly unintelligible to the people of France, so that at last the Imperial Government was compelled to yield to popular resistance; and, with the aforesaid exception, the decimal system was virtually abolished by a decree of the 12th of February, 1812, establishing what was called the *Usual or Customary System* of weights and measures, of which a new *Toise* or fathom of 6 feet, for the use of engineers, architects, and mechanics, exactly equal to 2 metres; a new *Aune* or ell for cloth measure, equal to 12 decimetres; a new *Boisseau* or bushel for dry goods, equal to one-eighth of a hectolitre; and a new *Livre* or pound weight, equal to one half-kilogramme—that is, to 5 hectogrammes, 50 decagrammes, or 500 grammes—were the standards, which were all subdivided, the usual foot duodecimally, the usual ell by binary division, and the usual bushel and usual pound weight by a mixture of binary and duodecimal division, into the same number of aliquot parts, bearing the same denominations as the ancient standards of France during the monarchy, from which they all differed more or less considerably. The old standards were, however, abolished under severe penalties; but the standards of the "Usual" were rendered equally legal with those of the "decimal system," and all persons who sold goods by retail were obliged to provide themselves with both. The standards of the usual weights and measures had their value according to the decimal system also marked on each, and it was left optional for retail dealers to sell by either, which led to so much imposition, that it was found necessary in 1816 to issue a royal decree of Louis XVIII., absolutely forbidding the use of decimals in shops, markets, or any other inferior departments of trade or retail business. Thus the people of France were obliged to make themselves masters of three different and incongruous systems of weights and measures—those of the Monarchy, those of the Republic, and those of the Empire; and it was not till the year 1837, that a law was enacted under King Louis Phillippe to abolish the Usual and inflexibly inforce the Decimal Metrical Standards after the 1st of January, 1840—it being hoped by the promoters of this law, of whom the celebrated Marquis de la Place, in the Chamber of Peers, was the most strenuous, that the rising generation of France had by this time become so generally instructed in decimal arithmetic, that they would be able to understand and appreciate the system.

In the year 1799, a work, entitled *Manual Pratique et Elémentaire des Poids et des Mesures, des Monnaies et du Calcul Décimal*, was published by S. A. Tarbé, containing tables of comparison of the former legal standards of France during the Monarchy, and those of the new decimal metrical system, with explanations and instructions for using them; to which, in a tenth edition of 1813, he added tables of the usual system also, in which he reprobated the adoption of the decimal system for the purposes of navigation and astronomy, in very strong language; and after giving an example of the confusion that would be caused thereby, he emphatically remarks, that "in the ordinary transactions of life, errors in calculation cost money—in navigation, they cost men;" and in his article on the mariner's compass, he is equally strenuous in opposing the decimal divisions of the circle, as applied to that instrument. But whilst so far strongly reprobating the decimal metrical system of the Republic, M. Tarbé took great care not to depreciate its application to the weights and measures of commerce, which has rendered his complex and voluminous tables, carried down to the present day by successive new editions, since published by his family, not only useful, as he modestly expresses it, but absolutely necessary to all bankers, merchants, contractors, land-surveyors, notaries, proprietors, employés of the administration, instructors and pupils of the schools of France, and to foreigners.

In conclusion, Sir Charles Pasley says that, by personal observation and inquiry in the shops and markets of France in the summer of 1854, he ascertained that the same confusion still prevails, and that one may buy goods either by the decimal or by the usual weights and measures; indeed, he thinks there is no case in which the metre has entirely supplanted the old measures, except for soundings as before mentioned, and for cloth measure, because it is a more convenient measure for cloth than the old French *Aune*, which was rather too long for that purpose. Under such considerations he thinks it will not be wondered at that he most strenuously opposed Mr. James Yates, and other advocates of that system, when they publicly recommended, at the Society of Arts and at the Institution of Civil Engineers, that we should abandon our own time-honoured units of measures, weights, and money, and adopt the revolutionary system of the French Republic, having become convinced that the decimal metrical system of the French, which was professedly intended for the imitation of all mankind, was as great a failure in science, as their other theories of liberty, equality, and the rights of man have been in legislation.

THE SITE OF THE NATIONAL GALLERY.

The report of the Royal Commission on the site of the National Gallery has just been published in the form of a blue-book of nearly 200 pages. As regards the proceedings of the commission, it appears that on the 12th of March a resolution was proposed to the effect that the evidence hitherto adduced, collectively considered, did not lead to any decisive conclusion against placing the new National Gallery within the metropolis; on which Mr. Faraday moved an amendment admitting this fact, but pointing to the advantage to be obtained by "the removal of the gallery to a clearer and more airy site;" which amendment was negatived by 3 to 2, Mr. Richmond voting with Mr. Faraday. The original resolution was afterwards adopted. At the meeting of the 7th of May a letter was read from Mr. Justice Coleridge, advocating the claims of the existing site in Trafalgar-square on the ground of its general accessibility. On the 21st of May, Professor Faraday moved two resolutions—first, "that in respect of the future plan of the National Gallery, the three leading considerations which should govern the choice of a site are clear space for a building of magnitude sufficient to provide for the prospective increase of the collection, accessibility to the public, and the preservation of the pictures; and, secondly, that, in the opinion of the commissioners, the first consideration is essential in any case, that the second and third, although of extreme importance, are highly antagonistic, inasmuch as the removal of the pictures to a clearer but distant place takes away that accessibility which the present site, although, no doubt, with a great amount of wear and tear, provides." On these two resolutions the commissioners divided, affirming the first by 4 to 1, and the second by 3 to 2. Mr. Richmond then proposed that after a resolution adopted on the 27th of April ("that it is not expedient to break up or remove the collections of ancient sculpture and archæology in the British Museum"), another resolution be added, to the effect that the future combination of sculpture with painting should be provided for in the new National Gallery, "a primary use of which should be to preserve examples of the art of past ages in all its branches in the order best adapted to exhibit their beauty and to illustrate their sequence and character." This resolution was negatived by three to two. It was also unanimously agreed that the choice of sites lay between the site of the present gallery (if sufficiently enlarged) and the estate at Kensington Gore. The result was that the chairman (Lord Broughton), the Dean of St. Paul's, and Mr. Cockerill voted for the present site in Trafalgar-square, and that Mr. Richmond (alone) voted for the Kensington Gore estate. Professor Faraday declined to vote at all, his mind being equally balanced between the two sites. The evidence taken before the commission is very voluminous. The witnesses examined were Sir C. Eastlake, P.R.A., Mr. H. Farrer, Mr. J. Nieuwenhuys, Mr. J. Bentley, Mr. Knight, R.A., Mr. Cooke, A.R.A., Mr. Parris, Mr. Mulready, R.A., Mr. J. M. Smith, Mr. Denning, Mr. Smart, Mr. A. Panizzi, Mr. E. Hawkins, Mr. W. H. Carpenter, Mr. Oldfield, Mr. Sydney Smirke, R.A., Mr. J. Bell, Sir C. Barry, Mr. Westmacott, R.A., Baron Marochetti, Mr. J. Ruskin, Mr. Hurlstone, Mr. J. Fergusson, the Chancellor of the Exchequer (Sir G. C. Lewis), Mr. E. A. Bowring, Mr. Doyle, Mr. A. J. B. B. Hope, M.P., Sir E. Landseer, R.A., Mr. J. F. Lewis, R.S.A., Mr. H. Warren, Mr. Donaldson, and Mr. Digby Wyatt.

VENTILATION BY THE STEAM-JET.

A somewhat novel application of the steam jet for the purpose of ventilating a coal mine has just been made by Mr. F. H. Pearce, of the Bowling Ironworks, near Bradford. The *Leeds Mercury* gives the following account of the application :—"The application is at present in operation in a pumping shaft, 120 yards in depth, the ventilation of which had been stopped by the water rising at the bottom of the pit during the time some alterations were being made in the pumps. The water having stopped the air-courses, the pit, to within a few yards of the top, became full of the gas known to miners as black or choke damp, which appears to have been discharged freely from some old workings, and thus it was rendered an impossibility for the workmen to descend until the removal of the gas had been effected and a constant current of pure air produced in the pit. Mr. Pearce has succeded in maintaining a perfect ventilation of the above-mentioned pit, simply by allowing a small jet of steam to issue into the atmosphere at a few feet from the top of pipes through which the water is forced up when the pumps are at work, and the pit can be worked with perfect safety. The workmen were enabled to descend 30 minutes after the steam had been turned into the pipes. The principle is exceedingly simple. The jet of steam issuing from the top of the pipes produces in them a partial vacuum, which draws the foul air up these pipes, and thence out of the pit with very great velocity. The cost of applying the steam jet in the above manner is very trifling; and this method of ventilation will doubtless be found a very safe and useful one in many instances, particularly in sinking deep shafts. In addition to other advantages, wood or any other kind of pipes may be used. It requires little or no attention, has no machinery which can get out of repair, produces a powerful current of air, and can be regulated at pleasure. As the steam is discharged into the atmosphere above the top of the pit, it does not interfere with the men working in the shaft."

PEEL MEMORIAL.

The Council of University College, London, as trustees of the fund of the Working Men's Memorial of Gratitude to the late Sir Robert Peel, have just sent collections of books, each collection costing £15, to the following Institutions, viz., the Mechanics' Institute, Hull; the Working Men's Library and Reading Room, Merthyr Tydvil; the Free Library, Dowlais; and the Institute of Popular Science and Literature, York. A gift of books of equal value has now been presented to every one of the 16 Institutions specially named in the deed declaring the trusts of the fund. In the future distribution to "any public library, Mechanics' Institution, reading-room, or literary or scientific association in the United Kingdom maintained by working-men, or to which working-men and youths have access gratis, or at a small charge," the Council are bound to take into consideration the amount of subscriptions derived by the fund from each place from which an application may be received. The annual income of the Peel Fund is £52. Gifts in augmentation would be acceptable.

FREE LENDING LIBRARIES.

The following is extracted from a Liverpool paper:—A visit to these libraries at the south and north ends of the town on any day of the week, will show the vast amount of interest taken in them by all classes of the community. The good effected by means of these invaluable libraries, in supplying mental food to hundreds of families who would otherwise be destitute of instruction, must be incalculable, and to cultivate and foster a taste for reading amongst our dense population ought to be the particular study of all those who wish to see a moral and social improvement wrought amongst the people. In the month of May alone the number of books issued amounted to 27,791, and the returns were 27,688, and every month new readers are added by hundreds. Unfortunately the want of sufficient accommodation is greatly felt at both libraries. New books are constantly purchased, and readers increase daily in number, but the premises, as at present arranged, are much too small to afford the requisite facilities for dealing with such an immense class of readers. At the north library the room allotted to the public whilst waiting to get their books changed will not hold more than 17 persons, and yet on Monday evening last there were no fewer than 60 individuals in attendance. The result was that a yard was crowded, and a line of persons extended into the street. This, we understand, is a common occurrence. At Hardie-street, in the south end of the town, the same state of things prevails. The room at that library will hold about 27 persons, but it often happens that more than double that number are waiting, and they, consequently, have to take their station in the street, and wait in a line. Now, to obtain books under such circumstances is certainly a search for knowledge under difficulties, especially in wet and inclement weather. At both libraries the premises, we believe, could be easily enlarged, and that, too, at no very great cost, there being ample space at the back to erect additional rooms. The increased demands of the public upon these libraries require something to be done in the way of increasing the facilities of the public, and it is to be hoped the library committee will take the matter into their prompt consideration.

SOUTH KENSINGTON MUSEUM.

During the week ending Aug. 15, 1857, the visitors have been as follows:—On Monday, Tuesday, and Saturday, free days, 3,891; on Monday and Tuesday, free evenings, 4,558. On the three Students' days (admission to the public 6d.), 493; one Students' evening, Wednesday, 188. Total, 9130.

PHOTOGRAPHIC PAPER.

The Industrial Society of Mulhouse has offered a prize* of a silver medal for 500 kilogrammes of paper possessing every quality necessary for photographic purposes. The conditions are, that the paper should be made of materials perfectly pure and homogeneous, entirely free from metallic spots, small holes, or marks of any kind; its thickness must be exactly equal throughout, with both sides alike, and it must be capable of being saturated with a liquid by floating for not more than ten or fifteen minutes, without its being necessary to warm the fluid; it must also be able, when in large sheets, to bear the necessary handling after soaking in water for several hours.

Home Correspondence.

THE APPLICATION OF THE SEWAGE OF RUGBY TO AGRICULTURAL PRODUCTION.

Sir,—I shall answer Mr. Edwin Chadwick and Mr. Sheriff Mechi separately, as they deserve. On the 12th of June, in No. 238, Vol. 5, page 435 of this *Journal*, Mr. Chadwick wrote:—

> "In respect to cereals the favourable results obtained by the farmers near Paris, are confirmed by three years' increasing crops obtained at Rugby by the application of sewage alone. Last year it was stated to me by Mr. Walker, to have been at the rate of 50 bushels per acre. At Mr. Mechi's and the new liquified manure farms in England, the yield of wheat has been almost invariably one quarter heavier than the highest obtained by the ordinary culture."

Here is a distinct statement of a yield at Rugby of six quarters and two bushels, worth at that time upwards of £20 an acre, "from the use of sewage alone," and at Mr. Mechi's of an extra quarter, worth during the year from £3 10s. to £4, by using liquid manure instead of solid. In the discussion on Mr. Lawes' paper "On the Sewage of London," Vol. 3, No. 120, page 281, Mr. Chadwick said "Mr. Lawes had spoken of sewage as best suited for grass-land. There was no warranty for this limitation; sewage manure had been applied to cereals with complete success;" and again, at the Central Farmers' Club discussion for February, 1855, Mr. Chadwick said (Mr. Mechi assenting) "that, as a general rule with wheats, they had found no instance where one-fourth more per acre had not been produced by liquid manure, than by the highest culture in top-dressing or other means."

It is with such statements as these, by which, during now nearly twelve years, Mr. Chadwick has been endeavouring to induce our agriculturists to pipe their farms, substitute liquid for solid manure, and pay for the sewage of towns instead of purchasing guano and superphosphate, that I find fault, as well as with his last circumstantial statement as to Mr. Walker's farm at Rugby. From my own personal investigation and enquiry, I believe them not to be warranted by the experience of practical men. My information, gathered on the spot, has led me to the inevitable conclusion that the farm never produced anything like 50 bushels by the use of sewage alone, and that when sewage alone was used the crops annually decreased. In confirmation of this, I referred inquiring minds to the farm itself, so accessible from all parts of England, to Mr. Berry Congreve, the tenant of half the estate, a gentleman of the first class of Warwickshire graziers, who had from the first managed all Mr. Walker's agricultural operations, and to Mr. Campbell who rents (to his extreme disappointment) the other half. Just as in my letter to this *Journal* of the 25th May, 1855, which Mr. Chadwick never ventured to answer, I referred to my friend Mr. William Torr, of Aylsby, one of the Council of the Royal Agricultural Society, who planned the well-known liquid manure dairy farm at Liscard, for "the reason why," he never repeated in Lincolnshire the pipe system he successfully planned in Cheshire to amuse the lesiure hour of a wealthy Liverpool merchant. Now, it must be remembered, that this farm at Rugby, with which Mr. Walker, on returning from India for a few years, amused himself with only ten acres of wheat, was held as a model of high farming for the imitation of all Europe, at the Brussels Congress, by Mr. Chadwick, and Mr. F. O. Ward. Mr. Chadwick himself, in a letter to Mr. Walker, related how Mr. Ward had spoken of Rugby as the centre of agricultural progress, and "Mr. Walker" (the Bombay solicitor), as "the man of the situation." In justice to Mr. Walker, who is a sensible man—although, of course, not sorry to be made a lion of and introduced to the Emperor—he laughed heartily at this. Mr. Chadwick has given no contradiction of the reply to his statements about the Rugby crops, contained in my letter of the 17th July, 1857, No. 243, Vol. 5 of this *Journal*. He never touches the pith of the whole question in dispute—the wheat crops of Mr. Walker's farm. He does not say that more than ten acres were under wheat; he does not repeat the statement of 50 bushels to the acre; he does not attempt to dispute that the cereal crops, so far from increasing under sewage manure, decreased, but he flies off to the questions untouched by me. I shall not, on this occasion, diverge into the engineering of the Board of Health, or defend the memory of Mr. Smith, of Deanston; but I beg to state that, although I make my statement as to the Rugby farm on my own responsibility, so far from Mr. Walker being ignorant of the object of my inquiries, as Mr. Chadwick implies, I visited that farm last winter, on Mr. Walker's invitation; I lunched with him, and found him familiar with my speeches in the discussions at the Society of Arts, and with every line of my controversy with Mr. Chadwick. On his table lay the pamphlet in which I have endeavoured to do justice to the liquid manure theory and theorists, and the late Board of Health. Mr. Walker, in the management of liquid manure, agreed with Mr. Lawes, rather than Mr. Chadwick, and therefore grew grass, not corn.

Whether I am competent or not to review agricultural theories, is a matter I must leave to others to decide.

As to the insinuation that I am retained to support "certain professional or trading interests," I deny it—but if it were true it would have nothing to do with my correctness as to such a matter of fact as the produce of wheat at Rugby. I am, &c.,

S. SIDNEY.

Central Farmers' Club, Blackfriars.

THE CULTIVATION AT TIPTREE HALL.

Sir,—I reply to Mr. Sheriff Mechi with regret. I am sorry to say anything disagreeable to a gentleman whose talents, whose social, whose hospitable qualities I so much admire, who has spent so much money in teaching us what to avoid, and has circulated at his own expense, with a few errors, many sound agricultural maxims, gathered from the best farms in Bedfordshire, Lincolnshire, and Norfolk.

Mr. Mechi has the high merit of having re-established the agricultural gatherings commenced a century back by Francis Duke of Bedford; and when, a year ago, Lord Berners entertained the Committee of the Central Farmers Club at Keythorpe-hall, and when, during the week of the Salisbury Royal Agricultural Show, from which I have just returned, Mr. Sidney Herbert conducted a large party over the farm of his enterprising tenant, Mr. Rawlence, and over his own Home Park, and entertained two hundred of us not only with a luncheon in the library at Wilton House, but with a statement and balance sheet of his own farming experiences, (which for candour, simplicity, and minuteness I commend to Mr. Mechi's attention as a model worthy of imitation), I said, and many farmer friends agreed with me, "Mechi was the man who set the great landlords the example of these social agricultural gatherings." But Mr. Mechi has been so imprudent as to pretend to answer my contradiction of the statement in which Mr. Chadwick called Tiptree Hall as a witness of the superior profitableness of liquid manure. Mr. Chadwick said, "at Mr. Mechi's and the new liquified manure farms, the yield of wheat has been almost invariably one quarter heavier than the highest obtained by ordinary culture," and his meaning was explained by his saying, on a previous occasion, "that as a general rule with wheats, they had found no instance where one-fourth more per acre had not been produced by liquid manure, than by the highest culture in top-dressing or other means."

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* The Society of Arts has also offered a premium for a similar paper. See the last Premium List, No. 174.

If this were true, the farmers of England must be idiots, indeed, not to adopt what would give them an additional six bushels an acre, worth from £2 to £3, at an annual expense according to Messrs. Chadwick and Mechi, of 6s. an acre only.

But I denied both the cause and the effect, saying, 1st. That Mr. Mechi employed not weak sewage, but strong, well-made liquid manure. 2nd. That he did not grow his corn crops cheaply by liquid alone, but that he made use of guano and salt, applied solidly, broadcast or drilled. 3rd. That Mr. Mechi's root crops were supplemented by drilling in solid artificial manures. 4th. That Mr. Mechi's corn crops were not superior. I will add now, that they have been, on an average of five years, very inferior to those of his neighbours carrying out the highest culture on inferior soil with solid manure. Of course I did not mean to refer to the wretched little peasant farmers who are to be found in Essex, scratching the earth round Tiptree. I referred to those who spent money liberally on the soil, as Mr. Mechi did, and who farmed high and wisely without liquid manure.

Mr. Mechi's good wheat crop of 1855, was grown not on poor heath land, but on good strong drained land, as I was informed at the time, by the first light land farmer in England, who saw it and praised it. This good crop was grown, as Mr. Mechi candidly informed his friend, with solid guano and salt, copied from the example of another Essex man, Mr. Fisher Hobbs, whose sharp gravel is a poorer soil than the Tiptree corn fields, and whose crops, grown with solid manure, were believed to be much heavier than Mr. Mechi's that year, certainly on an average of years several bushels an acre heavier. So, instead of Mr. Mechi being able to dispense with solid manure and the expensive assistance of guano and superphosphate by piping his farm, as Mr. Chadwick would lead uninformed readers to believe, it turns out on inquiry that the liquid manure is an expensive addition of rainfall, and we have no figures or facts to show that the extra expense pays.

As to the story about the roots, which "public duty," to use Mr. Mechi's words, compels me to tell, it is this. The visitors admired Mr. Mechi's fine crop of mangel-wurtzel. "Is this all grown by liquid manure," asked my friend, Mr. B. "Oh, yes," replied Mr. Mechi; "it has had two dressings, and is to have two more;" thereupon my incredulous friend dug up a root, and found "superphosphate sticking to its fibres." Mr. Mechi had given his roots artificial rain, but he had previously and wisely given a solid dose of artificial manure, after the advice contained in a debate which took place at our Farmers' Club, in April, 1856.

Mr. Nesbitt, the agricultural chemist, said, "Let me now speak of mangel-wurtzel. In this case you want, in addition to the phosphates, an increase of nitrogenous materials." I recollect being down at Mr. Hutley's farm (in Essex) on one occasion, and perceived that my friend Hutley, without science, completely threshed my friend Mechi with science. Mr. Hutley first applied 15 or 20 loads per acre of farm-yard dung in the autumn, and ploughed the land five or six times. In the spring, before sowing, he applied 3 cwt. of guano, 4 cwt. of salt, and some rape cake, and drilled the mangel seed with a little superphosphate. The result was what I computed to be 40 tons per acre on Mr. Hutley's farm, whereas Mr. Mechi averaged only about 13 tons. Mr. Mechi's farm has, I believe, improved (by imitating Mr. Hutley) since. I never saw finer mangel-wurtzel than Mr. Hutley's. Of course, there was no manure required for the next wheat crop.

Mr. Mechi followed in the debate, and never mentioned liquid manure, but said, "He concurred with Mr. Nesbitt. His largest crop of mangel, 43½ tons to the acre, had been grown by twenty to thirty loads of farm-yard manure, 5 cwt. of guano, with 2 cwt. of salt; manuring the surface, then double trenching, and again manuring the deep furrows. Such treatment paid in the growing crop, and greatly increased the after crop." I need say no more. I leave your readers to judge whether I have stated facts, and whether Mr. Mechi, in his desire to support Mr. Chadwick, has stated all the facts material for knowing how his crops, when they were great crops, were produced.

I don't think, after this plain recapitulation, that your readers will agree in classing me with those who opposed the use of gas, steam, and electric telegraphs. Let me hint that there have been Mechis of recent date wasting fortunes on flying machines, and in old times patronizing, with no little wit and eloquence, the search after perpetual motion and the philosopher's stone.

I am, &c., S. SIDNEY.

Central Farmers' Club, Blackfriars, August 1, 1857.

SOCIETY OF ARTS EXAMINATIONS.

Sir,—Having had the pleasure of reading the letter, signed "J. C. Buckmaster," inserted in the *Journal* of June 19, I beg to say a few words in reference to it. I was much struck with the account given by him of his success with the classes. He says, "We never had any difficulty in getting attendance at these classes. Some of the students came seven or eight miles." How much this account differs from the one that might, with justice, be given by the teacher of the classes which I attended during their short existence. My experience in these classes, although they were connected with an Institution in Union, would warrant me in giving a less encouraging description of the proceedings.

I recollect an observation of one of the teachers, an M.A., who gave his gratuitous services to a class in "English Grammar and Composition." "It is a pity," he observed, "that the young members don't attend better—it is so much to their own interest." I am not certain that we had all the essentials named by Mr. Buckmaster. I cannot see how good teachers can be had, selected from the class they have to teach. The teachers that I should suppose most suitable to the class in question, are those who are in actual service. Such teachers as those who superintend the National Public Schools, most of whom are trained to the work, would be found suitable for such classes. The school inspectors, however, thinking it very undesirable that they should teach both day and evening classes, do not encourage them. No prudent teacher, I imagine, will undertake to attend an evening class without the consent of the inspector.

The essential—"there must be an object to work for," is of the highest importance. Without an object to point to, it is no easy matter to urge young men to study. As a member of adult classes, my experience will warrant me in saying that it it is much easier to form classes than to continue them. Young men being pretty much their own masters, their attendance is chiefly in proportion to the amount of self-denial they possess. It is often observed, and I have no doubt truly, that "the love of learning ought to stimulate students to exertion." The students so stimulated will, I think, form a small minority. It is difficult to persuade young men that a moderate share of learning is indispensable to the enjoyment of a rational mode of existence. Understanding the meaning of "an advance of salary," there is, perhaps, no better stimulant to exertion for those who regard learning as a stepping-stone to a position which will enable them to handle more £. s. d. The defective state of education in England is itself productive of the indifference which is often complained of. An advance of salary, however, as a stimulant to study, can affect only a small portion of the young men of this country. Knowing that there is not a chance of promotion to better their situations for all, young men, pressed closely on this subject, reply that they have enough of learning to serve the purpose of following their trade; of making a shoe, driving a shuttle, slaughtering an ox, or attending their business at the factory. To these young men I do not see how education can be "made a necessity." It would be in vain to stimulate them by telling them that study disciplines the mind, and enables it to meet the difficulties of life with confidence. There is nothing, perhaps, in which a man may sooner deceive himself than in the matter of education. If it be true that the tendency of all knowledge is to convince us how little we know, it is no less true that ignorance will puff us up with the idea that we are sufficiently educated.

There is a powerful stimulant wanted to induce young men to study, and the certificates awarded by the Society of Arts can be of service to only a few of those for whom they are intended. All the young men of the kingdom could not become clerks, &c., and there ought to be an object to work for, that everyone might hope to attain, the possession of which would be of some value to all.

To discover some plan of operation that will be universal in its effect, is worth careful study; for, if the latent thinking ability of the masses could by any means be called into action, who could estimate the result?

Without professing to be able to supply this important want, I will venture to suggest the propriety of associating the elective franchise with the certificates of the Society of Arts. There appears to be a strong wish among the young men of the working classes to possess the elective franchise. Many of the young members of our reading-room show much aptness for politics. The attention which they bestow upon the parliamentary debates, editorial articles, &c., leaves hardly a doubt that if it were possible to obtain the use of a vote at the parliamentary elections, together with a certificate of merit, the number of students at the Society of Arts examinations would be greatly increased. Instead of reading books of a light and trivial character, by which they get little or no profit, they would be engaged in classes studying the useful kinds of knowledge.

Such a plan is, at least, worth a trial, for the usual objections made to an extension of the franchise could hardly be made to this scheme, and the young men who have the industry and perseverance necessary to obtain a certificate of merit at the Society of Arts examinations, would be well able to make a judicious use of the elective franchise. I am, &c.,

S. SKINNER.

Warwick-street, Carlisle, July 3.

Proceedings of Institutions.

Devonport.—The committee, in presenting the sixty-fourth report of the Mechanics' Institute, thank the members for the cordial support which has been afforded them during the past six months. Although during the year the number of members had fallen to 667, so rapid was the recovery that on the 5th of March the number of members had increased to 1063. The great falling off during the summer quarters prevented the committee from making such additions to the library as they deemed desirable, and deterred them from improving the interior of the building. A very large proportion of the sum necessary to establish a school of art has been subscribed, and it is hoped that before the next half-yearly meeting the whole of the amount necessary will be realized, and the school opened. Admiral Sir Michael Seymour, K.C.B., has made a further donation of £5 towards this object. A valuable addition has also been made to the fund by the gratuitous services of Mrs. Crowley, Miss Carne, the Right Hon. Lord Graves, and Mr. Winterbottom, at the concert given in aid of that object, as well as by a lecture delivered gratuitously by Mrs. Clara Lucas Balfour. The Society has also been favoured by gratuitous lectures from Mr. Towson, Mr. Offord, Mr. Swain, and Mr. Lane. The French classes, at present numbering twenty members, under their teacher, Mons. De Larue, continue their studies with unabated zeal and attention, and are productive of great practical benefits to the pupils, some of whom having made considerable progress in French conversation.

Annan.—The ninth annual report of the Mechanics' Institute states that the Institution continues to prosper, although, during the summer and autumn quarters, there has been a slight falling off in the number of members, consequent upon the cessation of hostilities in, and subsidence of exciting news from, the East. A considerable augmentation, however, has taken place during the winter and spring quarters. The library has been again increased during the last year by about sixty volumes, all of which, with the exception of a few volumes presented by friends, were purchased with the funds of the Institute. The issue of books has been large, numbering nearly 200 volumes weekly, during the winter quarter. On the 25th Nov. last, Christopher Harkness, Esq., Dumfries, delivered an excellent lecture on Psalmody and Madrigals, illustrated by a numerous and efficient choir. During the winter, the following lectures were delivered: "Our Bodies, and how they live," by Dr. Grierson, Thornhill; "On the duty of Intellectual Cultivation," by the Rev. Robert Nichol, Chesterfield; "On newspapers," by the Rev. James Rome, Hull; "Lessons from Great Men's Lives," by Samuel Neil, Esq., Moffat; "To whom and to what does Britain owe her pre-eminence among the nations?" (first part) by the Rev. James Gailey, Annan; "The works of the Rev. Charles Kingsley, of Eversley," by the Rev. Augustus Clifford Bell, M.A., Dumfries; "Peter the Hermit," by the Rev. J. G. Murray, Auchencairn: "The Ancient Sports and Social Usages of Scotland," by the Rev. Chas. Rogers, LL.D., Stirling. The anniversary soirée was held in the Lady-street Assembly Room on the evening of the 13th Feb. last, Sir John H. Maxwell, Bart. of Springkell, in the chair. Addresses were then delivered by M. J. Rae, Esq., M.D., Carlisle; the Rev. William Cæsar, Tranent; George Steel, Esq., Annan; and the Chairman. On Friday, the 27th Feb. last, Sheriff Trotter, Dumfries, delivered an instructive lecture on the Solar and Astral Systems, illustrated by a beautiful diagram. The literary and discussion class, instituted for the purpose of writing papers upon and discussing subjects of a literary or scientific nature, has been kept up during the greater part of the year, and marked proficiency attained by its members. During the past year a great variety of articles of value and curiosity have been kindly presented to the museum. The Committee have lately made arrangements for the opening of evening classes, and they consider it very desirable that an effort should be made to procure a building for the Institute, particularly as a public hall and reading-room is much wanted. The Penny Savings Bank in connection with the Institute continues to prosper in a marked degree: many new depositors have been added during the past year.

To Correspondents.

The reply of Mr. W. Miller, of the Bank of England, to Dr. Gray's letter on the Decimal Question, will appear in the next number of the *Journal*.

PARLIAMENTARY REPORTS.

SESSIONAL PRINTED PAPERS.

Par. No.

Delivered on August 11*th.*

212. Lunacy Commission (Scotland)—Return.
227. Sligo Borough Election Petition—Minutes of Evidence.
239. Australian Colonies—Copy of Correspondence.
248. Mr. Richard Hall—Copies of Correspondence.
178. Bills—Sale of Obscene Books, &c., Prevention (amended).
180. ——— Judgments.

Delivered on August 12*th.*

250. Chelsea New Bridge Bill—Report from Committee.
253. Oaths taken by Members—Report from Committee.
205. Exchequer, &c.—Returns.
179. Bills—Joint Stock Companies Act (1856) Amendment.
183. ——— Industrial Schools—Lords Amendment.

Delivered on August 13*th.*

164. Railway Acts—Return.
236. Imports and Exports (Canada and United States)—Return.
249. British Spirits—Return.
258. East India Company—Account.
184. Bills—Fraudulent Trustees, &c., Lords' Amendments.
185. ——— Charitable Trusts Acts Continuance.
186. ——— Probates and Letters of Administration (Ireland) (as amended in Committee and on re-commitment).

Delivered on August 14*th.*

7. County Treasurers—Abstract of Accounts.
208. Highways—Return.
217. Cambridge Borough Election Petition—Minutes of Evidence.
188. Bills—Trustees Belief.
189. ——— Customs and Excise.
190. ——— Jurisdiction in Siam.
191. ——— Militia.
192. ——— Customs.

Delivered on August 15*th and* 17*th.*

209. East India (Railways)—Return (a corrected Copy).
196. Lights for Steam and Sailing Vessels—Return.
214. Statute Law Commission—Return (a corrected Copy).
257. River Thames—Copies of Correspondence.
264. Hainault Forest—Return.
266. Royal Mint (Sydney Branch)—Return.
268. Ordnance Survey (Ireland)—Return.
187. Bills—Crowded Dwellings Prevention (amended).
194. ——— Parochial Schoolmasters (Scotland) (No. 2).
India (Mutinies in the East Indies)—Further Papers.

Delivered on August 18*th.*

179 (2). Ordnance Survey—Return.
246. Westminster Bridge—Report from Committee.
259. Seamen's Savings Banks—Account.
272. Light Gold Coin—Return.
193. Bill—Customs (amended).
Army (Purchase and Sale of Commissions)—Report of the Commissioners.

PATENT LAW AMENDMENT ACT.

APPLICATIONS FOR PATENTS AND PROTECTION ALLOWED.

[*From Gazette, August* 14.]

Dated 30*th June*, 1857.

1828. Joseph Alsop and Edward Fairburn, Kirkler's Mill, Mirfield, Yorkshire—Improvements in machinery for the manufacture of bread, biscuits, and cakes.

Dated 14*th July*, 1857.

1950. Samuel Nye, 79, Wardour-street—Improvements in chaff-cutting machines.
1952. William Wyatt, Bury St. Edmunds—Improvements in hay-making machines.
1956. William Stettinius Clark, 133, High Holborn—Improvements in machines for harvesting grain and grass crops, and in the automatic delivery thereof. (A communication.)
1958. Hugh Smith and Frederick Moore Smith, Porchester-square—An improvement in fire-arms.
1960. Thomas Ashton, Abbey Mills, Morpeth, Northumberland—An improvement in teasing, scribbling, carding, and combing engines.
1962. William Henry Gauntlett, Middlesbro'-on-Tees—Improvements in thermometric apparatus.

Dated 15*th July*, 1857.

1964. William John Locke, Edgeley, Cheshire—Constructing an improved oil can.
1966. Edmond Bertin, Aldgate—A new manufacture of fibre, suitable for the purposes to which hemp and flax are usually applied.
1968. Gavin Walker and James Clachan, Glasgow—Improvements in looms for weaving.

Dated 16*th July*, 1857.

1974. John Cox, Georgie Mills, Edinburgh—Improvements in apparatuses to enable persons to progress in swimming.

Dated 17*th July*, 1857.

1978. Charles Fréderic Vasserot, 45, Essex-street, Strand—An apparatus for measuring and registering the flow of liquids. (A communication.)
1982. William Barwell, Birmingham—An improvement or improvements in casting metals.
1984. John Henry Johnson, 47, Lincoln's-inn-fields—Improvements in steam boilers. (A communication.)
1986. Alfred Upward, Duncan-terrace, Islington—An improvement in the manufacture of coke.
1988. Thomas Roberts and John Dale, Manchester—Improvements in obtaining pigments from dye-woods, and in the application of a pigment to printing paper hangings.

Dated 18*th July*, 1857.

1990. James Austin, Millisle Mills, Donaghadee—Improvements in machinery or apparatus for ploughing or cultivating land.
1992. George James Wainwright and Charles Timothy Bradbury, Dukinfield, Cheshire—Improvements in apparatus for diminishing the amount of waste in the use of cops for manufacturing purposes.
1994. William Edward Newton, 66, Chancery-lane—An improved construction of combined steam boiler and radiator for warming apartments or buildings. (A communication.)

Dated 20*th July*, 1857.

1996. Richard Bolton, Blackburn—An improved mode of weighting the yarn-beam in looms used in the manufacture of cloth by steam power.
1998. Frederick Hall Holmes, Blackwall—Improvements in magneto-electric and electro-magnetic machines.
2000. Richard Archibald Brooman, 166, Fleet-street—Improvements in the manufacture of pipes and tubes. (A communication.)
2002. William Edward Newton, 66, Chancery-lane—Improved machinery for feeding flour and mixing and kneading dough for the making of bread and biscuits. (A communication.)
2004. Robert James Mary'on, 40, Hooper-street, Lambeth—Improvements in the construction of propellers and in arrangements of engines for working the same for propulsion of ships or vessels.
2006. Joseph Conway, Margam Cotton Works, Taibach, South Wales—Improvements in the production of copper rollers for printing calico and other fabrics.

Dated 21*st July*, 1857.

2008. Josiah Claughton Arnall and George Greenhow, Yorkshire Glass Bottle Company, Ferry-bridge, near Pontefract, Yorkshire—Improvements in the manufacture of glass bottles and jars, and in the apparatus connected therewith.
2010. Frederick Warner, Jewin-crescent, Cripplegate—Improvements in ball and other cocks, and valves.
2012. William Edward Newton, 66, Chancery-lane—Improved machinery for manufacturing screws, or screw caps, of sheet metal. (A communication.)

Dated 22*nd July*, 1857.

2015. James Hall, Lancaster—Improvements in the mode of preventing incrustation in boilers.
2016. Alfred Vincent Newton, 66, Chancery-lane—Improved machinery for grinding and polishing stone, glass, and other materials. (A communication.)
2017. Joseph Kirby, Bodicote, Oxon—Improvements in hay and other rakes.
2018. Henry Doulton, Lambeth—Improvements in the manufacture of earthenware drain and other pipes.
2019. Murdoch McKay, Hackney, and Lewis Rose, Holborn—Improvements in apparatus to be used in washing and scouring household linen and other textile fabrics.

Dated 23*rd July*, 1857.

2020. John King, Cannon-street—Improvements in the preparation of peat and peat coke or charcoal, and in machinery or apparatus for that purpose. (A communication.)
2021. Moses Clark, Saint Mary Cray, Kent, and George Bertram, Edinburgh—Improvements in machinery or apparatus for cutting paper.
2022. William Deakin and William Phillips, Birmingham—Certain improvements in the manufacture of metallic pens and penholders.
2025. William Hudson, Burnley, and Christopher Catlow, Clithero—Certain improvements in looms for weaving.
2026. Edward Wilson, Worcester—An improved method of consuming smoke.
2027. Charles Norris, Calder Chemical Works, Sowerby-bridge, Halifax—Improvements in the manufacture of sulphate of alumina, and the application of the same so manufactured in dyeing, printing, paper making, and such like purposes.

Dated 24*th July*, 1857.

2028. Joseph Needham, Piccadilly—Improvements in fountain pens.
2029. James Burrows, Wigan—Certain improvements in steam engines.

Dated 25*th July*, 1857.

2031. Joseph Bennett, Pimlico—Improvements in boring tools for wells, shafts, and like purposes.
2033. John Scott Collins, Liverpool—Improvements in reefing and furling of ships and other vessels' sails, and in the manufacture of the same.
2034. Julius Schonemann, 89, Portland-street, Portland-place—Improvements in the construction of weighing machines. (A communication.)
2035. Frederick Oetzmann and Thomas Luis Plumb, 56, Great Russell-street—Improvements in upright pianoforte actions.

Dated 27*th July*, 1857.

2036. John Gedge, 4, Wellington-street South, Strand—Improvements in doubling machines. (A communication.)
2037. William Williams, Pembroke—Improved graving slips for the repairing of ships.
2038. William Blake Williamson, Bradford, Yorkshire—Improvements in looms employed for weaving textile fabrics and fibrous materials.
2039. John Walter Friend, Freemantle, Southampton—An improved meter for registering the flow of water and other liquids.
2040. Richard Archibald Brooman, 166, Fleet-street—Improvements in motive-power engines. (A communication.)
2041. Nicolas Saintard, Paris—An improved break for railway and other carriages.
2043. Joseph Ridsdale, Minories—An improvement in ships' scuttles.
2045. Benjamin Richardson, Wordsley, near Stourbridge—An improvement in the manufacture of articles in glass, so as to produce peculiar ornamental effects.
2046. George Tomlinson Bousfield, Loughborough-park, Brixton—Improvements in apparatus for retarding and stopping carriages on railways. (A communication.)
2048. Patrick Danvers, New York, and George Whitfield Billings, Plainfield, U.S.—An improved means for rolling hoops and wheel tyres.

Dated 28*th July*, 1857.

2049. James Higgin, Manchester—An improved method of drying garancine or other moist substances.
2050. William Stettinius Clark, 133, High Holborn—Improvements in automatic feeding printing press. (A communication.)
2051. Edward Hallen, Cornwall-road, Lambeth—Improvements in the construction of bedsteads and similar articles to recline or sit on.
2052. Octavius Henry Smith, Thames Bank Distillery—An improvement in supplying steam to water to heat the same, and in preventing what is technically called priming of steam.
2053. William Hirst, Bath—Improvements in manufacturing felted fabrics.
2054. George Tomlinson Bousfield, Loughborough-park, Brixton—Improvements in apparatus for feeding water to steam boilers. (A communication.)
2055. Prosper Brunot, 37, Boulevart de Sebastopol, Paris—Improvements in springs for petticoats and other articles of dress.
2056. Robert Jackson, Glasgow—Improvements in protecting certain parts of the body from disfigurement by cutaneous diseases.
2057. William Proctor, Bristol—Improvements in the manufacture of sulphuric acid.
2058. Edward William Baxter, Sidney-street, Mile-end—An improved mode of preparing glass labels, advertising tablets, and ornamental devices upon glass.
2059. Jules Dortet and André Barthelemy Denis, Paris—An improved safety padlock.
2061. Thomas Till and William Gardiner, Birmingham—An improvement or improvements in preventing collisions on railways.
2062. John Clay, Birmingham—An improvement or improvements in saddles.
2063. John Bethell, Parliament-street—Improvements in the construction of ships and other vessels.

Dated 29*th July*, 1857.

2065. John Bertwistle and Daniel Bertwistle, Padiham, Lancashire—Improvements in ventilating.
2067. Samuel Lawrence Taylor, Cotton-end, Bedford—Improvements in steam engines.
2069. William George Plunkett, Belvidere-place, Dublin—Improvements in the application of new materials to the manufacture of paper pulp and yarn for textile fabrics, cordage, &c.
2071. Jonathan Burnett, 18, Side, Newcastle-upon-Tyne—Improvements in the manufacture of chloride of lime, or bleaching powder.

Dated 30*th July*, 1857.

2073. James Purcell, 15, Mount-street, Whitechapel-road—Improvements in attaching or securing buttons to articles of clothing.
2075. William McKinley and Robert Walker, 4, Orchard-street, Paisley—An improvement in the manufacture of moulds for forming the soles of boots and shoes.
2077. John Frearson, Birmingham—Improvements in seeding, cutting, shaping, and piercing metals.

Dated 31*st July*, 1857.

2079. James Alfred Limbert, Royal Navy—Improvements in marine engines.
2081. Luke Cooke, Blackburn—Improvements in machinery or apparatus for preparing cotton, wool, or other fibrous substances to be spun.
2083. Thomas Forsyth, Manchester—Improvements in and applicable to side valves for steam engines. (A communication.)
2087. Henry Genhart, Liege, Belgium—An improved apparatus for cleaning and sharpening knives, and cleaning spoons and forks.
2089. George Inman, Susannah-street, Poplar—An improved construction of locomotive engine.

Dated 1*st August*, 1857.

2091. William Jewett Harris, Greenwich—Improvements in the construction of dining and other tables.
2095. James Tatlow and Henry Hodgkinson, Wirksworth, Derby—Certain improvements in railway breaks and signals.
2097. Thomas Rickett, Castle Foundry, Buckingham—Improvements in implements for cultivating land.
2099. Augustin Julien Michel Ramar, 49, Broad-street, Golden-square—Improvements in ornamental and portable fountains.
2101. George Brooks Pettit and Henry Fly Smith, Oxford-street—An improved cap or cover for the glasses of gas and other lights.

Dated 3*rd August*, 1857.

2103. Robert Davison and James Lee, Lansdowne Spinning Mill and Weaving Factories, Limerick—Improving the edge or selvage of linen, cotton, woollen, silk, or any other cloth or fabric, while in the act of weaving.

Dated 4*th August*, 1857.

2105. Leon Duriez, junr., 39, Rue de l'Echiquier, Paris—An improved apparatus for stopping horses.
2107. Eugène Antoine Dumergue, Paris—A new description of fringes.
2109. Peter Macpherson, Edinburgh—Improvements in wheeled carriages or vehicles.
2111. Charles Iles, Birmingham—An improvement or improvements in the manufacture of thimbles.
2113. William Colborne Cambridge, Bristol—Improvements in press wheel rollers or clod crushers.

WEEKLY LIST OF PATENTS SEALED.

August 14*th*.

445. William Cooke.
464. Harby Barber.
480. Samuel Dyer.
483. G. Frederick Lee Meakin.
484. David Lloyd Price.
491. Henry Young Darracott Scott.
524. James Brown.
569. Brook Hodgson and John Carter.
1571. Cherie Martel.
1612. John Gedge.
1625. Griffith Jarrett.
1643. William Wilkins.
1727. Henry Dunington.
1731. Lockington St. Lawrence Bunn.

August 18*th*.

479. David Cheetham.
481. Louis Léon Foucher.
495. Edward Edwards.
498. John Rowland Crook.
502. Wilhelm Zipser and Johann Peter Klein.
512. John Middleton and William Stent.
516. Michael Grouse.
518. William Gossage.
607. Frederick William Mowbray.
616. Thomas Gray.
718. William Edward Newton.
784. Nathan James Greenwood.
1472. Henry Whatley Tyler.
1534. George Watson Pye and Thomas Oldknow.
1646. James Buchanan.
1654. Malcolm Macdonald.
1770. Joseph Exley and John Ogden.

PATENTS ON WHICH THE STAMP DUTY OF £50 HAS BEEN PAID.

August 10*th*.

1758. Walter Blundell.
1760. John Gibson.
1765. John Benjamin Daines.

August 11*th*.

1764. George Weston.
1776. Benjamin O'Neale Stratford, Earl of Aldborough.
1777. John Norton.
1788. William Burgess.

August 12*th*.

1773. Henry Smith.
1922. Thomas Craddock.

August 13*th*.

1771. William Todd.
1800. Julian Bernard.
1816. Samuel Kershaw and James Taylor.
1831. James Worrall, junr.

August 14*th*.

1789. William Siddons.
1812. Peter Armand le Comte de Fontainemoreau.
1911. Peter Armand le Comte de Fontainemoreau.

WEEKLY LIST OF DESIGNS FOR ARTICLES OF UTILITY REGISTERED.

No. in the Register.	Date of Registration.	Title.	Proprietors' Name.	Address.
4014	August 11.	Press	William James Brown	Nottingham.
401	„ 14.	Watch Protector	Henry Slader Gilling	1, Upper Charles-street, E.C.
4016	„ 15.	Connecting parts of Gutters or Water-troughs	James King	Reading.

Journal of the Society of Arts.

FRIDAY, AUGUST 28, 1857.

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DEPUTATION TO LORD PALMERSTON.

A deputation from the Society of Arts, consisting of the Rev. Dr. Booth, F.R.S., Chairman of the Council; Lord Ebrington, M.P., Vice President, Major-General Sir Frederick Smith, M.P., and Colonel Sykes, M.P., with Mr. Le Neve Foster, Secretary, had an interview with Lord Palmerston, on Monday last, on the subject of the Society of Arts examinations.

THE SOCIETY'S EXAMINATIONS FOR 1858.

The Council have received an invitation from the Council of the Birmingham and Midland Institute to hold their Examinations at Birmingham, as one of the "Provincial Centres" for 1858.

SUGGESTIONS FOR STATISTICAL INQUIRY INTO THE EXTENT TO WHICH MERCANTILE STEAM TRANSPORT ECONOMY IS AFFECTED BY THE CONSTRUCTIVE TYPE OF SHIPPING, AS RESPECTS THE PROPORTIONS OF LENGTH, BREADTH, AND DEPTH.

By Charles Atherton, Chief Engineer of Her Majesty's Dockyard, Woolwich.

[Presented to the British Association at Dublin.]

At the Cheltenham meeting of the British Association, in August, 1856, I had the honour to present a paper on "Mercantile Steam Transport Economy." The principal objects of that paper were, in the first place, to expose the difficulty which attends all investigation and even all discussion on maritime affairs, in consequence of the technical terms in which shipping, especially steam shipping, is spoken of, and officially registered as respects the size or magnitude of vessels and machinery, having no definite meaning expressive of the capability of ships for carrying weight of cargo, or the capability of the machinery for the production of working power; and in the second place, after getting the better of the foregoing difficulty by rejecting the records of tonnage and nominal horse-power as being indefinite, and basing my calculations on load displacement, as expressing the actual magnitude and weight of the mass propelled through the water, and assigning an arbitrary but definite amount of working power based on indicator measurement to the term horse-power, and availing myself of maritime statistics already published as to the actual performances of vessels, and of the received laws which are recognised as expressing the mutual relations of displacement, power, and speed under definite conditions of practical application, I was enabled to demonstrate approximately the proportional increased rate of pecuniary cost which attends an increased rate of speed at which cargo per ton weight may be conveyed by steam ships of any definite size and type, according to the length of passage and speed that may be required; for example, assuming a passage of 3,250 nautical miles to be performed by a vessel of 2,500 tons load displacement, and of which the co-efficients of dynamic duty were assumed to be known and equal, and of a comparatively high order, the vessels respectively being fitted for speeds of 8, 10, and 12 knots per hour, it was shown that the cost of transport per ton weight at the speed of 12 knots per hour would be about 50 per cent. above the cost that would be incurred by a speed of 10 knots, and about 100 per cent., or double the cost incurred by a speed of 8 knots; and if the vessels be of a certain comparatively inferior type of build, as indicated by a lower co-efficient, but still of such type as is commonly employed, the rate of freight per ton weight of cargo conveyed at the 12 knots speed on the passage referred to, was found to be about double the rate if conveyed at the speed of 10 knots per hour, and about three times the rate incurred by a speed of 8 knots an hour.

Applying this estimated difference of cost incurred by difference of type to the aggregate trade of the country, as shown by the statistical returns of the Customs' House, it was suggested that the pecuniary interest of the great paymaster, "the public," is involved to the extent of millions per annum, simply by the difference of type of build and condition of the ships and engines, and administrative management by which the foreign trade of the country, as respects transport, may be prosecuted. These points of my former paper are now referred to, by way of introduction to the following paper, in which it is purposed to continue the subject matter of my former dissertation, by showing the extent to which the weight carrying capability of ships of given tonnage, whether rated by the gross register tonnage (new measure) under the Merchant Shipping Act of 1854, or by the tonnage builders' measure O.M. (also commonly called "burden," and still generally in use though legally superseded in 1835,) is dependent on the relative proportions of length, breadth, and depth to which ships may be constructed, and it is submitted for the consideration of the Association that this point of inquiry comes to be of special importance, seeing that the tendency of the present times to build vessels of great magnitude as respects length and breadth, whilst the load draught is restricted by local circumstances within the definite limit of the minimum depth of water of the ports to be frequented, has a direct tendency to involve a condition of things as respects proportions of build adverse to Public Interests, for the public will have to bear the brunt of freight charges proportional to the cost expenses that may be incurred in the general administration of shipping affairs. We may just as well assert that the public has no interest in the efficiency of our army and navy as that it has no interest in the efficiency of our commercial shipping. Rates of freight (excepting on occasions of national emergency) must be ruled on the aggregate by the general average cost at which the general service of mercantile transport is actually performed, whether it be well or ill performed, and the general introduction of proportions of build which can only perform their service at high rates of freight above the prime cost rates which would duly remunerate vessels of superior type, involves pecuniary considerations that may well form the subject of special statistical inquiry to be prosecuted at the instance of the British Association. The application of statistical science in connection with shipping as a means of inquiry into the principles of Mercantile Steam Transport Economy is, I may say, a new subject of inquiry, to which the British Association, and, I must add, the Society for the Promotion of Arts, Manufactures, and Commerce, have given public vitality. The question of Maritime Transport Economy has a bearing on public interests analogous to the operation of the rail and the telegraph.

A further object of this paper is, that by means of the following table (A) which has been prepared to show the mutual relations which subsist in ships of given variations of build between Tonnage Builder's Measurement, O.M., gross Register Tonnage, Weight Tonnage, or the capability of ships to carry weight of cargo, and the corresponding Displacement when ships are loaded down to a determinate load line; and Table B showing the mutual relations of displacement, power, and speed, we may thus have the means of connecting (that is within the limitations of the variations of build referred to in Tables A and B) through the intermediate element "displacement," the two Tables A and B, thus establishing the mutual relations within the limits aforesaid, between builder's tonnage, gross register tonnage, and weight or cargo tonnage, with the power required to attain a given speed, thus enabling us to show the bearing of proportions of build as affecting Mercantile Steam Transport Economy.

In the first place, therefore, before entering on this exposition, and in consideration that persons generally, even amongst those who devote their time to popular and statistical studies, and to scientific pursuits, and even assume the responsibilities of legislation on shipping, are not familiar with the technical meaning of the terms tonnage and burden, which are of such frequent recurrence in discussing the properties of shipping, as compared with the ordinary and unsophisticated meaning of those words, and are actually and unconsciously misled by those terms, when used technically in shipping sophistry, having a signification quite at variance with their ordinary meaning, I will endeavour to dispel this mystery by a few remarks in explanation of the terms "tonnage and burden," which, above all other terms, are most amenable to the foregoing singular imputation, namely, that their technical meaning is directly at variance with the ordinary signification of the said words; for example, ship's "tonnage" is not spelt with a u, "tunnage," and we all know that a "Ton," as distinguished from "Tun," popularly signifies 2240 lbs. weight, or 20 cwt., each cwt. being 112 lbs. The ordinary acceptation of the word "ton" implies an unit of weight, not of measure. Thence it is popularly inferred that the "tonnage" of a ship means the number of tons weight which constitute the proper load of a ship; but what is a ship's tonnage as implied in the terms tonnage O.M., tons burden, register tonnage? It has nothing whatever to do with weight. By the old law, termed builders' measurement O.M., which, though legally superseded in 1835, is still practically in use, and constitutes to this day the rule which, even in the Government service, generally regulates the builder's contract price of shipping, the measurement of this tonnage is regulated by the length of the ship and its breadth only, taking no cognisance of depth. It has nothing whatever to do with the load draught of water for which a ship may be constructed. Provided that the length and breadth of two ships be the same, the builders' tonnage O.M. will be the same, though the load draught of one ship be 30 feet and of the other only 3. This same tonnage, builders' measure O.M., is also frequently called by the equally delusive term "burden," though, as above shown, it has nothing to do with burden; for example, in shipping advertisements we see daily that "tons burden" is a designation by which ships are commonly advertised. It is true that Parliament abolished that law of tonnage, builder's measurement O.M., or the so called "burden," in 1835, but, nevertheless the Government have continued to uphold the rule (builder's measurement) as the base of their ship-building contracts, and ships, as respects their comparative size, are still only known to the world generally by their so called tonnage or tons burden, or builder's measurement O.M. No steps having been taken by the Government to discontinue and forbid the use and adoption of the old law of measurement, though repudiated by statute in 1835, it has continued to prevail, and merchants, following the example of the Government, make it the general base of building contracts to the present day.

It is, therefore, submitted for the consideration of the British Association, that the statute abolition of tonnage builder's measurement O.M., also called "burden," ought not to be permitted to lie dormant. It should be expressly decreed that the said builders measurement O.M. is not legally binding in any contract, either for the building, or freighting, or chartering of ships, and that the definition and measurement of "tonnage" shall be in accordance with the existing law, viz., the Merchant Shipping Act of 1854, subject to such amendments thereof and additions thereto as may be found necessary to render the Act complete for all the purposes of shipping registration.

And now, what is Tonnage Registration under the new law—the Merchant Shipping Act of 1854? To begin with, vessels constructed previously to 1854 are permitted, at the option of their owners, to retain their former tonnage or be measured under the new law, and be registered accordingly, and the statistics or Parliamentary returns of shipping do not show to what extent this privilege, of optionally withholding the former registration, has been acted upon, so that our present registration under the new law, the Act of 1854, is a mixed registration, and we do not know the ingredients thereof or their proportion, but the measurement under the new law of all ships built since May, 1855, is an internal measurement, no notice whatever being taken of external measurement, or of the light draught line or constructor's load line, or any limitation thereof assigned by reference to "freeboard;" and, consequently, tonnage under the new law, the Act of 1854, does not give the weight-carrying capability of ships, nor any comparison thereof, if of different types of form, and of different build as respects the weight of the materials employed; but if the law does not give the weight carrying capability of the ship, the question is—What does it give? It gives an admissibly correct measurement of the internal capacity of ships, but calls this capacity "Tonnage," giving a new signification to the word ton, for each 100 cubic feet of this internal space of the ship available for holding cargo is called a ton of tonnage. Tonnage is, therefore, a mere measurement of space, not of weight. Then, again, as regards cargo, even a ton of cargo is not always rated as 20 cwts. The freight of goods is charged either by measurement or by weight, and the same word ton is applied in all cases; 100 cubic feet constitute a ton of shipping; 40 cubic feet of some kinds of goods, and 50 feet of others, constitute a ton of measurement goods; and cargo is rated accordingly for freight, provided the said measure do not weigh a ton. 100 cubic feet of light goods may, therefore, be stowed in one ton of shipping, and be rated for freight at 2½ tons; that is, a ship of 1,000 tons register tonnage may be expected to stow 2,500 tons of measurement cargo, or, better still, 1,000 tons weight of heavy goods, and fill up with 2,000 tons measurement of light cargo, and thus go to sea with this 3,000 tons of freight, no limitation being assigned to draught. Such are the anomalies of tonnage, and yet we talk of statistics based on tonnage; and what is the consequence of this abuse of the word ton? Why, in times of war, our tonnage registration of shipping not only affords no reliable data, but actually deceives as to the capabilities of vessels for carrying ordnance and such like heavy military stores. Experience of the past three years has abundantly shown how great would be the advantage to the public if, in times of war and emergency, when there is no time for the re-admeasurement of shipping, and when shipping must be chartered or purchased at any price, our registration of shipping were available, like a tabular ready-reckoner, for giving the government a correct idea of the capability of every ship for conveying weight of cargo, in addition to the present registration of capacity for holding cargo, and, consequently, a comprehensive view of the value of ships for military transport service embracing both weight and roomage.

The statistical insufficiency of the present system of shipping registration as a record of the capability of ships, is shown by the following Table:—

TABLE A,

Shewing approximately the extent to which the mutual relations of TONNAGE BUILDERS' MEASURE (O.M.), TONNAGE GROSS REGISTER NEW MEASURE under the Merchant Shipping Act of 1854, WEIGHT TONNAGE or Capability for carrying tons weight of Cargo, and LOAD DISPLACEMENT as regulated by some definite limit of Freeboard, are dependent on the proportions of Length, Breadth, and Depth that may be adopted in the construction of Ships of the same Nominal Tonnage.

CONSTRUCTOR'S DIMENSIONS.							ELEMENTS OF CONSTRUCTION.										MUTUAL RATIOS OF TONNAGE AND LOAD DISPLACEMENT.															
																	TONNAGE. Bds. Measure O.M. taken at 100.				TONNAGE. Gross Register, taken at 100.				TONNAGE. Weight Tonnage, taken at 100.				Load Displacement taken at 100.			
Designation of Vessels.		Length (L).	Breadth (B).	Load Draught (D), exclusive of keel.	Freeboard (F), taken at $\left(\frac{L}{40} + \frac{B}{12}\right)$	Depth external (D + F).	Load Displacement taken at $\frac{6}{10}$ L B D.	Freeboard Buoyancy taken at $\frac{7}{10}$ L B F.	External Measurements (M), being the Load Displacement + Freeboard Buoyancy.	Light Displacement (m) ready for Cargo, taken at one-third M.	Weight Tonnage (W), being the difference between the Load and Light Displacements.	Ratio of Internal to External Measurements.	Register Tonnage (gross), at 100 feet internal measurement per ton (G R).	Builders' Tonnage (O.M).	Ratio of Length to Breadth.	Ratio of Load Draught to Breadth.	Builders' Tonnage (O.M.)	Register Tonnage (Gross).	Weight Tonnage.	Load Displacement.	Register Tonnage (Gross).	Builders' Tonnage (O.M.)	Weight Tonnage.	Load Displacement.	Weight Tonnage.	Builders' Tonnage (O.M.)	Register Tonnage (Gross).	Load Displacement.	Load Displacement.	Builders' Tonnage (O.M.)	Register Tonnage (Gross).	Weight Tonnage.
		Feet.	Feet.	Feet.	Feet.	Feet.	Tons.	Tons.	Tons.	Tons.	Tons.		Tons.	Tons.			Tns.	Tns.	Tns.	Tns.	Tns.	Tns.	Tns	Tns.	Tns.	Tns.	Tns.	Tns.	Tns	Tns.	Tns.	Tns.
Ships of 1000 tons Bds. Measure O.M.	A	152.40	38.10	25.40	6.35	31.75	2317	695	3012	1004	1313	.81	854	1000	4 to 1	.66 to 1	100	85	131	232	100	118	177	273	100	76	65	177	100	43	37	57
	B	152.40	38.10	19.05	6.35	25.40	1738	695	2433	811	927	.80	681	1000	4	.50 to 1	100	68	93	174	100	147	136	256	100	107	73	187	100	57	39	53
	C	152.40	38.10	12.70	6.35	19.05	1158	695	1853	618	540	.79	512	1000	4	.33 to 1	100	51	54	116	100	196	106	228	100	185	94	215	100	86	44	47
	D	195.90	32.65	21.77	6.80	28 57	2188	820	3008	1003	1185	.79	832	1000	6	.66 to 1	100	83	119	219	100	120	143	264	100	84	70	184	100	46	38	54
	E	195.90	32.65	16.33	6.80	23.13	1641	820	2461	820	821	.78	656	1000	6	.50 to 1	100	66	82	164	100	154	125	252	100	122	79	200	100	61	40	50
	F	195.90	32.65	10.88	6.80	17.68	1093	820	1913	638	455	.77	516	1000	6	.33 to 1	100	52	46	109	100	196	88	214	100	217	111	237	100	91	47	42
	G	235.20	29.40	19.60	7.35	26 95	2129	958	3087	1029	1100	.77	832	1000	8	.66 to 1	100	83	110	213	100	120	132	257	100	91	76	194	100	47	39	52
	H	235.20	29.40	14.70	7.35	22.65	1597	958	2555	852	745	.76	680	1000	8	.50 to 1	100	68	75	160	100	147	110	235	100	133	91	213	100	63	43	46
	I	235.20	29.40	9.80	7.35	17.15	1065	958	2023	674	391	.75	531	1000	8	.33 to 1	100	53	39	107	100	189	74	219	100	256	136	274	100	94	50	37
	K	271.40	27.14	18.10	9.04	27.14	2285	1306	3591	1197	1088	.75	942	1000	10	.66 to 1	100	94	109	229	100	106	115	244	100	92	86	210	100	44	41	48
	L	271.40	27.14	13.57	9.04	22.61	1713	1306	3019	1006	707	.74	782	1000	10	.50 to 1	100	78	71	171	100	128	91	219	100	128	110	241	100	58	45	41
	M	271.40	27.14	9.05	9.04	18.09	1143	1306	2449	816	327	.73	626	1000	10	.33 to 1	100	63	33	114	100	159	52	181	100	303	191	345	100	87	55	29
	X	540 0	90.0	30.0	21.00	51.00	25000	20412	45412	15137	9863	.77	12238	20939	6	.33 to 1	100	58	47	119	100	171	81	205	100	213	123	233	100	84	49	39
1		2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32

In the foregoing Table it will be observed that the 12 vessels, A, B, C, &c., to M, are all of the same Builder's Tonnage O. M. namely 1000 tons; that we have three vessels, (A, B, C,) whose length is four times the breadth of beam; three vessels, (D, E, F,), whose length is six times the breadth; three vessels, (G, H, I,) whose length is eight times the breadth; and three vessels, (K, L, M,) whose length is ten times the breadth; and that, in each set of three vessels, the load-draught of water is taken at two-thirds of the breadth, half the breadth, and one-third of the breadth; so that in this table we have a gradation of proportions, the length varying from four times to ten times the breadth, and the load-draught varying from two-thirds to one-third of the breadth, which limits embrace nearly all the proportions of shipping in mercantile use. The arbitrary elements of construction on which the calculations (Table A) have been prosecuted, are explained in the various headings. It will be observed that the freeboard, (column 5), or non-immersed depth above the load-draught line, has, in each case, been taken at one-fortieth of the length, plus one-twelfth of the breadth of beam. There is no recognized rule for the determination of this element. Constructors of shipping follow their own rules or their own caprice in determining freeboard or the position of the construction load-line. The above combined proportions of length and breadth have been adopted, as giving a progression, which, it is believed, will meet the ordinary allowance of freeboard at which loaded ships of all sizes are sent to sea. The various elements of construction (columns 7 to 16) are believed to be closely approximate to ordinary practice, and the ratios of nominal tonnage to actual weight-carrying capability, shown in columns 17 to 20, are therefore, approximately, such as would result from the ordinary build of shipping.

Now, on comparing the ratios which result from the constructive proportions of the ships A, B, C, &c., M, we have the following results:—1st, it appears (see columns 17 to 20), that, taking builders' tonnage at 100, the ratio of register tonnage varies from 85 to 51 in ships (A, B, C,) of which the length is four times the beam, and from 94 to 63 in ships (K, L, M,) of which the length is ten times the beam, that is, taking the extreme cases embraced within the limits of this table, a ship of type K will have a register tonnage of 94 tons for every 100 tons builders' measure; but a ship of type C will have only 51 tons register for each 100 tons builders' measure. It also appears (see columns 17 and 19), with reference to builders' tonnage O.M., taken at 100, that the capability for carrying weight fluctuates from 131 tons weight down to 33 tons weight per 100 tons of builders' measure O.M., or a ship of 1,000 tons builders' tonnage of the type A will have four times the weight-carrying capability that is afforded by a ship of 1,000 tons builders' tonnage of the type M.

With reference to register tonnage (gross), new measure, under the Act of 1854, taken at 100, it appears (see columns 21 and 23) that the capability for carrying weight varies from 177 tons down to 52 tons per 100 tons of register tonnage; or a ship of 1,000 tons gross register tonnage of the type A will have nearly 3½ times the weight-carrying capability that is afforded by a ship of 1,000 tons gross register tonnage of the type M.

With reference to weight tonnage, or the capability of ships to carry weight, it appears (see columns 25, 26, 27) that, with the proportions of ship A, each 100 tons of weight-carrying capability will require a vessel of 76 tons builders' measure (O.M.), or 65 tons gross register tonnage; but with the proportions of ship M, each 100 tons of weight-carrying capability will require a vessel of 303 tons builders' measure O.M., or 191 tons gross register tonnage.

With reference to the mutual relation of the load displacement and weight tonnage, it appears (see columns 29 and 32) that with the proportions of ship A, each 100 tons of load displacement will give 57 tons of weight tonnage, but with the proportions of ship M, each 100 tons of load displacement will give only 29 tons of weight tonnage, that is, a ship of 1,000 tons load displacement, on the type of ship A will carry double the weight that would be carried by 1,000 tons of displacement on the type of ship M.

It might possibly be objected that the foregoing variations which have all been calculated with reference to ships of 1,000 tons builders' measure, O.M., are not applicable to vessels of a different magnitude; therefore, to test the validity or otherwise of this remark, the same constructive elements have been applied to a ship (X) of 20,939 tons builders' measure O.M., and 25,000 tons load displacement, the length of this ship (X) being six times the beam, and the load draught one-third of the beam, this type or proportion being the same as that of ship (F). On comparison of the ships X and F (see columns 29, 30, 31, and 32), it will be found that the ratios of builders' tonnage, register tonnage, weight tonnage, and load displacement, are closely similar throughout: for example, in ship F, each 100 tons load displacement gives 42 tons of weight tonnage, but in ship X each 100 tons of load displacement gives 39 tons of weight tonnage. Hence, we may infer that the results of these calculations, showing the extent to which the weight-carrying capabilities of ships is irrespective of the nominal tonnage, whether it be builders' tonnage O.M., or gross register tonnage N.M., and is approximately dependent on the constructors' proportions of build, admit of general application to vessels of all sizes of the types referred to in Table A. Surely the above exposition is sufficient to establish the necessity of some legislative enactment under which builders' tonnage O.M., and register tonnage N.M., should not be permitted to co-exist as recognised measurements of the Mercantile Capabilities of Shipping. Under existing circumstances, it is respectfully submitted for the consideration of the British Association, that a clause be introduced into the Merchant Shipping Act that the only legal signification of the word "tonnage" shall be the measurement prescribed by the said Act, and that no other signification of that term shall be legally binding in commercial transactions. Also, that the capability of ships for carrying weight, as measured with reference to some determinate free-board, be made an item of registration.

The ratios, above set forth, as expressing the weight-carrying capability of ships, include the whole weight available for engines, boilers, coal, consumable stores, and cargo; so that, as applied to steam ships, these ratios, as respects weight-tonnage for cargo chargeable for freight, assume a new phase of great importance as affecting mercantile steam transport economy; and, for the purpose of inquiring into the modification thus introduced, the following Table (B) has been calculated, showing the mutual relations of displacement, power, and speed, for vessels up to 25,000 tons load displacement, the speed varying from 6 knots up to 25 knots per hour.

The element, "Load Displacement," being common to both Tables A and B, we have, by the aid of these Tables combined, the means of showing the mutual relations between builder's tonnage O.M., gross register tonnage N.M., weight-tonnage, load-displacement, speed, and power of all vessels within the limits of the types or proportions of build referred to in Table A, and thus showing to what an extent mercantile transport economy by steam is affected by the proportions of length, breadth, and depth to which steam-ships may be built. For example: let us compare a ship of the type, D, namely, length six times the beam, and load-draught two-thirds the beam, having weight-carrying capability or weight-tonnage of 2000 tons, with a ship of the same capability for carrying weight, but of the type (I), namely, length eight times the beam, and load-draught one-third the beam. By Table A, (columns 25, 26, 27, and 28), it appears that the ship of type (D), of 2000 tons weight-

TABLE B.

Showing the mutual relation of Displacement, Power, and Speed of Steam Ships, it being assumed that, for vessels of similar type of form, propelled by engines of proportionally equal efficiency, the law of variation is expressed by the Formula $\frac{V^3 D^{\frac{2}{3}}}{\text{Ind. h.p.}} = X$ (X being a variable coefficient for Vessels of different type, but a "constant number" for Vessels of the same type), and that the present state of Steam-ship and Engine construction assigns a possible value to the coefficient X = 250, V being the speed expressed in nautical miles per hour, D being the displacement at 35 cubic feet to the ton, and the unit of Indicated horse-power (h. p.), being equivalent to a weight of 33,000lbs. raised one foot high in one minute of time.

Speed { Nautical Miles per hour.	DISPLACEMENT IN TONS WEIGHT.																								
	250	500	750	1000	1250	1500	1750	2000	2250	2500	2750	3000	3500	4000	4500	5000	6000	7000	8000	9000	10000	12500	15000	20000	25000
	h.p.	h.p.	h.p.	h.p.	h.p.	h.p.	h.p.	h.p.	h.p.	h.p.	h.p.	h p.	h.p.	h.p.	h.p.	h.p.	h.p.	h.p.	h.p.	h.p.	h.p.	h.p.	h.p.	h.p.	h.p.
6	34	55	71	86	100	114	124	137	148	159	169	179	200	221	235	252	286	315	345	372	400	466	524	638	739
7	54	86	113	137	159	179	200	218	235	253	269	286	317	345	373	397	452	500	549	592	635	738	835	1011	1173
8	81	128	169	204	238	269	297	325	352	378	400	424	473	511	559	593	676	747	818	885	952	1104	1242	1511	1751
9	116	183	241	291	335	383	421	463	500	537	573	604	669	731	790	845	963	1064	1166	1252	1339	1570	1773	2149	2393
10	159	252	330	399	462	524	580	635	687	738	783	831	921	1007	1090	1159	1321	1459	1597	1723	1849	2156	2436	2950	3420
11	211	335	440	531	614	697	769	845	914	981	1042	1104	1225	1338	1446	1546	1759	1942	2125	2290	2456	2870	3240	3926	4552
12	274	435	569	690	800	904	1000	1097	1183	1274	1352	1435	1590	1739	1880	2004	2277	2518	2760	2981	3202	3726	4206	5096	5910
13	349	552	725	877	1018	1149	1273	1395	1508	1620	1722	1825	2022	2208	2391	2550	2898	3203	3509	3790	4071	4737	5347	6479	7513
14	436	690	905	1095	1269	1435	1590	1742	1880	2023	2149	2280	2525	2760	2984	3184	3619	4000	4381	4729	5078	5917	6679	8094	9384
15	536	849	1114	1347	1563	1766	1956	2143	2315	2488	2646	2805	3108	3395	3671	3916	4454	4921	5389	5820	6251	7276	8218	9953	11542
16	650	1032	1352	1636	1898	2142	2374	2601	2808	3019	3212	3405	3771	4126	4457	4751	5406	5975	6545	7067	7590	8832	9974	12078	14008
17	780	1235	1620	1961	2273	2570	2846	3120	3367	3622	3850	4081	4519	4940	5344	5699	6479	7162	7845	8469	9094	10591	11961	14487	16802
18	926	1466	1923	2329	2701	3050	3381	3703	3999	4299	4568	4847	5368	5865	6344	6765	7693	8504	9315	10060	10805	12572	14197	17195	19945
19	1089	1725	2262	2739	3178	3588	3974	4355	4702	5057	5375	5699	6313	6900	7462	7959	9049	10003	10957	11833	12710	14790	16701	20227	23457
20	1270	2011	2638	3195	3705	4185	4637	5080	5485	5898	6269	6648	7362	8045	8704	9280	10553	11666	12779	13800	14821	17246	19475	23591	27359
21	1470	2332	3059	3698	4281	4858	5368	5880	6358	6828	7252	7700	8532	9329	10095	10736	12237	13515	14794	15960	17126	19969	22549	27310	31672
22	1690	2681	3517	4252	4922	5582	6172	6761	7311	7849	8339	8853	9808	10722	11609	12344	14069	15538	17008	18348	19689	22956	25923	31398	36415
23	1932	3064	4019	4858	5625	6379	7052	7726	8352	8969	9529	10115	11209	12224	13265	14104	16077	17755	19434	20967	22501	26230	29622	35876	41611
24	2194	3481	4567	5521	6391	7248	8011	8778	9491	10190	10826	11495	12734	13924	15070	16025	18268	20175	22083	23823	25564	29801	33651	40762	47277
25	2480	3936	5161	6239	7223	8194	9056	9921	10726	11517	12237	12993	14393	15746	17033	18112	20645	22801	24957	26925	28894	33682	38040	46068	53436

tonnage, will be 1680 tons builder's tonnage O.M., 1400 tons gross register tonnage N.M., and 3680 tons load-displacement; and, by Table B, it appears that 950 Ind. h.p. would propel this ship at the speed of 10 knots per hour; the consumption of coal at the rate of 3½lbs. per indicated horse-power per hour, would be 30 cwts. per hour; and, supposing the engines, boilers, &c., to weigh one ton weight per five ind. h.p., the weight of these will be 184 tons; this ship may, therefore, be expected, on the data of the said tables, to make a passage of 3500 nautical miles in 350 hours, consuming 525 tons of coal, and carrying 1291 tons weight of freight cargo. But what would be the case with the vessel of 2000 tons weight-tonnage of type (I); it appears that the builder's tonnage O.M., would be 5120 tons, the register tonnage N.M., 2720 tons, and the load-displacement 5480 tons; and by Table B it appears that, to propel this vessel at 10 knots per hour, would require 1240 ind. h.p., these engines weighing 248 tons, and the consumption of coals 39 cwts. per hour; so that, on the data of the said Tables, this ship on the type (I) may be expected to make the passage of 3,500 nautical miles in 350 hours, consuming 682 tons of coal, but carrying only 1070 tons of freight cargo. Hence it appears that with vessels of type D, we have expenses proportional to 1,400 tons register (N.M.), and 950 Ind. h. p., with income proportional to 1291 tons weight of freight; while with the ship of type I we have expense proportional to 2720 tons register (N.M.), and 1240 Ind. h.p., with income proportional to only 1070 tons weight of freight; that is, the comparative prime cost expenses of transport in these two cases (assuming the cost incidental to one Ind. h.p. to be equal to that of one ton of gross register tonnage), will be in the proportion of $\frac{1400 + 950}{1291} = 1.82$ to $\frac{2720 + 1240}{1070} = 3.70$, or in the proportion of 1 to 2. Such is the effect of mere difference of proportion or type of build on Mercantile Steam Transport Economy. This example of a difference or extra cost of 100 per cent. on the prime cost rates of freight per ton weight of cargo conveyed on the same passage, and at the same rate of speed is evidently occasioned by the load draught of water being two-thirds of the beam in one case, that of the vessel D, and only one-third of the beam in the other case, that of the vessel I, and yet we see that the type or proportion of small load draught in proportion to beam is a type or proportion of build, towards which the progressive increase in the size of shipping is gradually leading mercantile practice as exemplified in the most extraordinary maritime enterprise of the present day, the *Great Eastern*.

The mechanical advantage which attends progressive increase of size as measured by load-displacement, is conspicuously shown by Table B, whereby we observe, that a vessel of 250 tons displacement requires 274 ind. h.p. to attain the speed of 12 knots per hour, being very nearly in the ratio of one ton displacement to one h.p.; but, if the ship be 2,000 tons, the ratio of displacement to power to attain the same speed (12 knots) will be 2 to 1; with a ship of 9,000 tons it will be 3 to 1; and with a ship of 20,000 tons it will be 4 to 1. A ship of the reputed size of the *Great Eastern*, viz., about 25,000 tons load-displacement, will require *proportionally* only about one-fourth of the power to attain a given speed that would be required by a ship of 500 tons displacement. Hence the great advantage of size, provided the ship be of good type and can be always fully loaded, but seeing that load-draught is limited by local circumstances and other considerations which may not limit the length and breadth, it becomes a matter of calculation to determine at what point the admitted advantages of size become neutralised with reference to any particular service by the limitation of load-draught in proportion to beam. Let us have all the advantages we can get without running into extremes, by which those advantages become sacrificed. Theory is a snare, unless it be commercially worked out to advantage.

Are not public interests involved in this matter, and is it not a matter of grave importance, meriting the attention of the British Association. I beg to conclude with the suggestion that it is only by statistics that the deficiencies of our present maritime system can be properly searched into and brought to light; and it is only by the force of statistical exposition that the required remedies can be devised. It is, therefore, respectfully submitted that the constructive type of shipping as respects the proportions of length, breadth, and depth, constitutes a subject of inquiry which merits the notice of the Statistical Section of the British Association.

FRANKFORT PHILANTHROPIC CONGRESS.

The meetings of this Congress will open on the 14th September, in the great hall of the Römer, of which the use has been granted by the Frankfort Government, and will last about seven days.

Detailed programmes may be had on application at the Society of Arts, John-street, Adelphi.*

ATLANTIC TELEGRAPH.

The following is the official report of the Engineer to the Directors of the Atlantic Telegraph Company:—

(Report.)

"To the Directors of the Atlantic Telegraph Company.

"London, Aug. 18.

"Gentlemen,—I forwarded by the *Leopard* a brief statement of the circumstances attending the fracture of the cable on the morning of the 11th instant, and I have now to lay before you the full particulars connected with the expedition.

"After leaving Valentia on the evening of the 7th inst., the paying out of the cable from the *Niagara* progressed most satisfactorily until immediately before the mishap.

"At the junction between the shore and the smaller cable, about eight miles from the starting point, it was necessary to stop to renew the splice; this was successfully effected, and the end of the heavier cable lowered by a hawser until it reached the bottom, buoys being attached at a short distance apart to make the place of union.

"By noon of the 8th we had paid out 40 miles of cable, including the heavy shore end, our exact position at that time being in lat. 51° 59 minutes 36 seconds N., long. 11° 19 minutes 15 seconds W., and the depth of water, according to the soundings taken by the *Cyclops*, whose course we nearly followed, 90 fathoms.

"Up to 4 p.m. on that day the egress of the cable had been sufficiently retarded by the power necessary to keep the machinery in motion at a rate a little faster than the speed of the ship; but, as the water deepened, it was necessary to place some further restraint upon it by applying pressure to the friction drums in connexion with the paying out sheaves, and this was gradually and cautiously increased from time to time as the speed of the cable, compared with that of the vessel, and the depth of the soundings, showed to be requisite.

"By midnight 85 miles had been safely laid; the depth of water being then a little more than 200 fathoms.

"At 8 in the morning of the 9th we had finished the deck coil in the after part of the ship, having paid out 120 miles. The change to the coil between decks forward was safely made.

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* For further particulars, see the present volume of the *Journal*, page 404.

"By noon we had laid 136 miles of cable, the *Niagara* having reached lat. 52° 11 minutes 40 seconds N., long. 13° 10 minutes, 20 seconds W., and the depth of water having increased to 410 fathoms.

"In the evening the speed of the vessel was raised to five knots per hour. I had previously kept down the rate at from three to four knots for the small cable and two for the heavy end next the shore, wishing to get the men and machinery well at work prior to attaining the speed which I had anticipated making.

"By midnight 189 miles had been laid.

"At 4 o'clock in the morning of the 10th the depth of water began to increase rapidly from 550 fathoms to 1,750 in a distance of eight miles. Up to this time 7 cwt. strain sufficed to keep the rate of the cable near enough to that of the ship; but as the water deepened the proportionate speed of the cable advanced, and it was necessary to augment the pressure by degrees until in the depth of 1,700 fathoms the indicator showed a strain of 15 cwt., while the cable and ship were running 5½ and 5 knots respectively.

"At noon on the 10th we had paid out 255 miles of cable, the vessel having made 214 miles from shore, being then in lat. 52° 27 minutes 50 seconds, N., long. 16° 00 minutes 15 seconds, W. At this time we experienced an increasing swell, followed later in the day by a strong breeze.

"From this period, having reached 2,000 fathoms water, it was necessary to increase the strain to a ton, by which the rate of the cable was maintained in due proportion to that of the ship.

"At 6 in the evening some difficulty arose through the cable getting out of the sheaves of the paying-out machine, owing to the tar and pitch hardening in the grooves, and a splice of large dimensions passing over them. This was rectified by fixing additional guards and softening the tar with oil.

"It was necessary to bring up the ship, holding the cable by stoppers, until it was again properly disposed around the pulleys. Some importance is due to this event, as showing that it is possible to lie-to in deep water without continuing to pay out the cable—a point upon which doubts have been frequently expressed.

"Shortly after this the speed of the cable gained considerably upon that of the ship, and up to 9 o'clock, while the rate of the latter was about 3 knots by the log, the cable was running out from 5½ to 5¾ knots per hour. The strain was then raised to 25 cwt.; but the wind and sea increasing, and a current at the same time carrying the cable at an angle from the direct line of the ship's course, it was not found sufficient to check the cable, which was at midnight making 2½ knots above the speed of the ship, and sometimes imperilling the safe uncoiling in the hold. The retarding force was, therefore, increased at 2 o'clock to an amount equivalent to 30 cwt., and then again, in consequence of the speed continuing to be more than it would have been prudent to permit, to 35 cwt. By this the rate of the cable was brought to a little short of 5 knots, at which it continued steadily until 3.45, when it parted, the length paid out at that time being 335 miles.

"I had, up to this time, attended personally to the regulation of the breakers, but, finding that all was going on well, and it being necessary that I should be temporarily away from the machine to ascertain the rate of the ship, and to see how the cable was coming out of the hold, and also to visit the electrician, the machine was, for the moment, left in charge of a mechanic who had been engaged from the first in its construction, and was acquainted with its operation.

"I was proceeding to the fore part of the ship when I heard the machine stop; I immediately called out to ease the break and reverse the engine of the ship, but when I reached the spot the cable was broken.

"On examining the machine, which was otherwise in perfect order, I found that the breaks had not been released, and to this or to the handwheel of the break being turned the wrong way, may be attributed the stoppage, and the consequent fracture of the cable. When the rate of the wheels grew slower as the ship dropped her stern in the swell, the break should have been eased; this had been done regularly before whenever an unusually sudden descent of the ship temporarily withdrew the pressure from the cable in the sea; but, owing to our entering the deep water the previous morning, and having all hands ready for any emergency that might occur there, the chief part of my staff had been compelled to give in at night through sheer exhaustion, and hence, being short-handed, I was obliged for the time to leave the machine without, as it proves, sufficient intelligence to control it.

"I perceive that on the next occasion it will be needful, from the wearying and anxious nature of the work, to have three separate relays of staff, and to employ, for attention to the breaks, a higher degree of mechanical skill.

"The origin of the accident was no doubt the amount of retarding strain put upon the cable, but had the machine been properly manipulated at the time, it could not possibly have taken place.

"It has been suggested as a cause of failure that the machinery is too massive and ponderous. My experience of its action teaches otherwise; for three days in shallow and deep water, as well as in rapid transition from one to the other, nothing could be more perfect than its working, and since it performed its duty so smoothly and efficiently in the smaller depths, where the weight of the cable had less ability to overcome its friction and resistance, it can scarcely be said to be too heavy for deep water, where it was necessary for the increased weight of cable to restrain its rapid motion by applying to it a considerable degree of additional friction. Its action was most complete, and all parts worked well together. I see how it can be improved by a modification in the form of sheave, by an addition to the arrangement for adjusting the breaks, and some other slight alterations; but with proper management, without any change whatever, I am confident that the whole length of cable might have been safely laid by it, and it must be remembered, as a test of the work which it has done, that, unfortunate as this termination to the expedition is, the longest length of cable ever laid has been paid out by it, and that in the deepest water yet passed over.

"After the accident had occurred, soundings were taken by Lieutenant Dayman, and the depth found to be 2,000 fathoms.

"It will be remembered that some importance was attached to the cables in the *Niagara* and *Agamemnon* being manufactured in opposite lays. I thought this a favourable opportunity to show that practically the difference was not of consequence in affecting the junction in mid-ocean. We therefore made a splice between the two vessels, and several miles were then paid out without difficulty.

"I requested the commanders of the vessels to proceed to Plymouth, as the docks there afford better facilities than any other port for landing the cable, should it be necessary to do so.

"The whole of the cable on board has been carefully tested and inspected, and found to be in as perfect condition as when it left the works at Greenwich and Birkenhead.

"One important point presses for your consideration at an early period; a large portion of the cable already laid may be recovered at a comparatively small expense. I append an estimate of the cost, and shall be glad to receive your authority to proceed with this work.

"I do not perceive in our present position any reason for discouragement, but I have, on the contrary, a greater confidence than ever in the undertaking. It has been proved beyond a doubt that no obstacle exists to prevent our ultimate success, and I see clearly how every difficulty which has presented itself in this voyage can be effectually dealt with in the next.

"The cable has been laid at the expected rate in the great depths; its electrical working through the entire length has been most satisfactorily accomplished, while the portion laid actually improved in efficiency by being submerged, from the low temperature of the water, and the close compression of the texture of the gutta percha.

"The structure of the cable had answered every expectation that I had formed of it, and if it were now necessary to construct another line I should not recommend any alteration from the present cable, which in its working has confirmed my belief that it is expressly adapted to our requirements. Its weight in the water is so adjusted to the depth that the strain is within a manageable scope, while the effect of undercurrents upon its surface proves how dangerous it would be to attempt to lay a much lighter rope, which would, by the greater time occupied in sinking, expose an increased surface to their power.

"I have the honour to remain, Gentlemen,
"Yours very faithfully,
"CHARLES T. BRIGHT."

The following additional reports have since been received by the Directors:—

"London, August 21.

"Gentlemen,—We, the undersigned commanding officers of the several ships composing the Atlantic Telegraph Squadron, have great pleasure in expressing our opinions with reference to the Atlantic Telegraph.

"We are of opinion, drawn from our several observations and experience, that no obstacles of a nautical or physical character exist in the way of the enterprise, and that the efficiency of the form of cable adopted by the Company is in every way adapted to its mission.

"With regard to the machinery, we are of opinion that the form of controlling power adopted and the mode of lubricating and adjusting the breaks admit of very great improvement.

"We are thoroughly convinced, from the soundings made by Lieutenant Berryman, United States Navy, on the plateau between Newfoundland and Ireland, subsequently confirmed by Lieutenant Dayman, Royal Navy, and the investigations of Lieutenant Maury, United States Observatory, and from our own nautical experience, that no under or surface current exists between these points to interfere with the successful laying of your cable.

"We all agree in thinking that no form of submarine telegraph cable could be devised more suitable in every respect to the object intended to be accomplished; that its lightness, toughness, and flexibility adapt it in every way for the purpose of being laid between Newfoundland and Ireland, and we are unwilling to recommend its modification or alteration in any way. We are also of opinion that no natural obstacles exist to prevent its being successfully laid between those points, and our views as to the future prospects of your enterprise are sanguine.

"We have the honour to be,
"Gentlemen, yours faithfully,
"J. W. B. WAINWRIGHT,
"Captain of Her Majesty's ship *Leopard.*
"JOSHUA R. SANDS,
"Captain of the United States frigate *Susquehanna.*
"W. L. HUDSON,
"Commanding the *Niagara.*
"C. NODDALL,
"Commanding Her Majesty's ship *Agamemnon.*"

"Dear Sir,—In answer to your note requesting me to sign the accompanying statement addressed to the directors of the Atlantic Telegraph Company, as my name is mentioned, I would rather not append my signature.

"This is my only reason, and I entirely concur in the opinions expressed therein.

"Believe me, dear Sir, yours truly,
"JOSEPH DAYMAN.

"Her Majesty's ship *Cyclops*, Portsmouth, Aug. 22."

"London, Aug. 24.

"Gentlemen,—We, the undersigned, who have been engaged as engineers during the construction, shipment, and submersion of the Atlantic cable, beg to submit to you our judgment as to its fitness for the object for which it was intended, in regard to material, dimensions, and structure.

"We consider it to be so eminently suited for laying in deep water that we cannot suggest any improvement in its form and construction, and do not recommend that any change whatever should be made in the manufacture of any future cable for crossing the Atlantic.

"The outer covering being composed of strands of iron wire, instead of single wires, as in former cables, gives such flexibility to the rope as almost to prevent the possibility of kinks occurring in the paying out, if the cable is properly coiled, while the strength with an equal weight of metal is also increased.

"In case of a broken wire passing into the paying out machine, no damage is done, while with the solid wire it sometimes unravels, and occasions serious inconvenience.

"The conducting wire being also formed of a strand of seven copper wires, the chance of continuity being lost in the circuit is reduced to a minimum, from the improbability of any flaw or weakness occurring in more than one of the seven wires at the same place.

"We are, Gentlemen, yours faithfully,
"CHARLES T. BRIGHT, Engineer to the Atlantic Telegraph Company.
"S. CANNING, Assistant-Engineer.
"F. C. WEBB, Assistant-Engineer.
"HENRY WOODHOUSE."

"London, Aug. 21.

"Gentlemen,—We, the undersigned, have pleasure in reporting to you that every experiment which we have made upon the cable, every test to which we have subjected it, both for its insulating and conducting power, has uniformly resulted in demonstrating the perfect fitness of the cable for its office.

"The treble covering of gutta percha so entirely provides for the remote possibility of accidental flaw occurring in either the first or second coat, that all risk of defective insulation is thus avoided.

"Experiments made with a short length had previously proved that an hydraulic pressure of five tons to the square inch in no way injured the insulation, and in the highest degree confirmatory of this is the result of the trial recently made in the great ocean depths. The actual pressure which a depth of water exceeding two miles had exerted upon its structure produced not the slightest injury to the insulation of the submerged portion of our cable; while the low temperature by which it was then surrounded produced, as had been anticipated, a distinctly beneficial effect on the electrical condition of the gutta percha. For a cable of great length, necessarily limited to a single conductor, we cannot suggest, on electrical or other grounds, any improvement upon the form adopted by the company.

"We are, Gentlemen, yours faithfully,
"WILDMAN WHITEHOUSE, Electrician.
"*S. F. B. MORSE, Company's Electrician on board the United States frigate *Niagara.*
"†W. THOMSON."

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* Professor Morse, inventor of the system of telegraphing known by his name.

† Professor of Natural Philosophy, Glasgow College.

Home Correspondence.

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THE DECIMAL QUESTION.

Sir,—There were two courses open to Dr. Gray, by which he might have escaped from the awkward position in which he has placed himself.

If his evidence before the Commissioners had been correct, he might easily have proved it; or, having discovered his mistake, he might frankly have acknowledged it; and the terms "perverse" and "unjustifiable" would have fallen to the ground. As it is, he perseveres in the attempt to give, by inuendo, an appearance of truth to that which he cannot establish by fact, and these terms, therefore, adhere to him with more force than ever.

As a difference between Dr. Gray and myself, the matter is not of the smallest consequence, but as it respects the first step towards the introduction of the decimal system into our weights and measures, it is of importance to show that which Dr. Gray denies, that the change we have made has been followed by all the advantages, and even by more than its projectors proposed to gain by it.

Dr. Gray says in his letter that he was led to re-assert the statement made in his pamphlet by Mr. Hubbard's mode of examination, founded upon that pamphlet. This is certainly not borne out by the printed evidence, as any one may see who chooses to refer to it, for there the subject is introduced in answer to a question asked by Lord Monteagle, and not by Mr. Hubbard, and is dragged in head and shoulders to support an assertion quite as untenable as the statement itself.

Let us examine this "plain straightforward business communication," which Dr. Gray makes his "friend of 30 years' standing" responsible for.

First—"That the change had not been attended by any reduction of labour, but, on the contrary, by an increase."

For 10 years previous to the gold discoveries in California and Australia, the average yearly influx and efflux of gold at the bullion office in the Bank, were, both together, about £6,800,000, as may be, seen by the Parliamentary returns. The average of the last six years is £18,500,000, or nearly three times as much. In August, 1852, the pressure upon the bullion office became so great that it was found necessary to re-arrange the whole office and to appoint an additional clerk, and in the following November, in the very midst of the pressure, without any additional assistance, the new system was introduced. It was a change from a system exceedingly complex to one of comparative simplicity, and was effected with the most perfect ease and without hindrance of any kind, and, ever since, the change has been attended in every respect by a saving of labour to all concerned, not only in account keeping, but in the operations of weighing and recording, and by a diminution of the chances of error. Were a recurrence to the old system to take place, it would require additional force to carry on the business of the office.

So much for the first part of the statement. We now come to the second:—"That the clerks were constantly obliged to refer to the tables showing the two systems." It is impossible that this could ever have been the case, because there never was any such table in use at the Bank, nor was there ever any need of such.

Third.—That "the new system was found so inconvenient, that two of the largest bullion brokers refused to use it."

Now, the following are by far the largest, if not the only bullion brokers, strictly speaking, in London:—Sharps and Wilkins, Mocatta and Goldsmid, Haggard and Pixley.

The two latter firms use no other than the new system, and the first use it in all their gold transactions. Who, then, can those "two of the largest bullion brokers" be, who found it so inconvenient that they refused to use it. Dr. Gray does "not consider himself at liberty to mention their names." Why is this? Surely those gentlemen are not ashamed of their nonconformity.

I have now gone through the statement ascribed to Mr. Haggard, and I think your readers will agree with me, that he has good reason to say, "The Lord deliver me from my friends."

I never had any doubt that Mr. Haggard said something to Dr. Gray, and that Dr. Gray understood Mr. Haggard to say what he has stated; but Mr. Haggard, well-informed, with his mind full of the technicalities of the subject, and Dr. Gray, totally ignorant, would need a common language, and be very likely to mistake one another.

Unfortunately, however, for Dr. Gray, in his letter, he has made the statement I have just shown to be incorrect his own, for he says:—"Fourthly, I had *assured* myself of the facts on the subject before I was examined;" and he goes on to say—"I had found, moreover, that Mr. Miller had been doing all in his power to obtain a contradiction of Mr. Haggard's statement on authority."

Of the former part of this statement I leave your readers to judge. As to the latter, I state, most emphatically, that there is not a syllable of it correct. When the statement first appeared in the pamphlet, three years ago, I reproached Mr. Haggard with it; but, from that day to this, I have never spoken to him upon the subject, or in any way attempted to get a contradiction of it.

Merely stated in a loosely-written anonymous pamphlet, it was not of any consequence; but made to appear in evidence before Her Majesty's Commissioners, it was very likely to give a false impression to a class of readers whom it is everybody's interest rightly to inform.

Dr. Gray sneers at what he calls my wonderful arithmetical discovery. I am ready to confess it was not very profound—"not so deep as a well"—but it was true, and "enough" for the non-divisibility-of-the-integerites. It was "small meat for babes," but very wholesome. If the Doctor's mind had always been nourished by such pabulum, it would not have lost that nice sense which is sometimes needful to distinguish between the truth and what only looks like it.

I have submitted Dr. Gray's questions to the Bullion Office, and have received the subjoined statement.

I am, &c.,

W. MILLER.

STATEMENT.

It is surprising that Mr. Haggard should have made the assertion that the new method of weighing at the Bank was inconveinent, as he is, or was himself, an advocate of a decimal system of notation, and published, about 4 years ago, a plan for the adoption of the pound and mil system in one of the periodical papers, and he has since privately circulated a pamphlet on the subject.

The advantages of decimal weights are, that they are much more easily read from the scale-pan, the weight is much less likely to be taken down erroneously, as there is no possibility of entering any denomination in the wrong column. The weight is called in that denomination in which the price is quoted, and thus the necessity of converting troy pounds into ounces is got rid of, and with it an opportunity of error.

The simplification of subsequent calculations need not be dwelt upon, as it is of the nature of the subject and too plain to require a word, all conversions being at once dispensed with, and the public having the advantage of a closer fraction in the estimate of the standard of their bars, $_{6}$ of $\frac{1}{1000}$ of an ounce being now treated as unity, whereas formerly all fractions under $\frac{3}{4}$ grains were not paid for.

ANSWERS TO DR. GRAY'S QUESTIONS.

1. The increase of clerks in the bullion office took place previous to the adoption of the decimal mode of weighing, and was occasioned by the gold discoveries in California and Australia, and by interior arrangements quite independent of any method of weighing.

2. All the brokers in London in their gold transactions conform to the decimal mode. The Bank in all its dealings, either in

gold or silver, uses no other weights, and recognises no others. In any case where dealers have not adopted the decimal system, they are, *ipso facto*, removed from the opportunity of expressing an opinion on the comparative merits of the old and new systems.

3. Goldsmiths and jewellers, whose weighing is but a small part of their business, follow, of course the practice of Goldsmith's Hall.

4. The introduction of the decimal weights did not necessitate "the calculation of an entirely new set of tables of the value of foreign coins for the use of the Bank itself," as no such tables do, *or ever did* exist.

5. The troy grain is never used in bullion transactions, and does not call for expression in the decimal system used at the Bank.

6. A set of decimal weights is no dearer than a set of the old ones.

PARLIAMENTARY REPORTS.

SESSIONAL PRINTED PAPERS.

Par. No.

Delivered on August 19th.

235. Great Yarmouth Election Petition—Minutes of Evidence.
261. Committees of Supply—Report from Committee.
195. Bills—Kelp Manufacture (Ireland).
196. ——— Judgments (amended).

First Session, 1857.

71. Baltic and Black Sea Fleets—Medical Statistical Returns.

Delivered on August 20th.

267. Army Huts—Return.
254. Grant's Apparatus for Ships and Vessels—Return.
278. Charitable Uses Bill and Roman Catholic Charities Bill—Lords' Report.
197. Bills—Divorce and Matrimonial Causes (amended).
198. ——— Burial Acts Amendment—Lords' Amendments.
199. ——— Sale of Obscene Books, &c., Prevention (as amended in Committee and on re-commitment).

Delivered on August 21st.

231. Sugar, &c.—Return.
284. Coroners—Return.

Delivered on August 22nd and 24th.

157. Lunacy—11th Report of Commissioners.
199. Lunacy (Scotland)—Copy of Correspondence.
283. Municipal Boroughs (Ireland)—Abstract of Statement.

Common Law (Judicial Business) Commissioners—Report.

Statistical Tables relating to Foreign Countries.

PATENT LAW AMENDMENT ACT.

APPLICATIONS FOR PATENTS AND PROTECTION ALLOWED.

[*From Gazette, August* 21.]

Dated 29th May, 1857.

1522. Peter Armand le Comte de Fontainemoreau, London, Paris, and Brussels—Improvements in the construction of smoke-consuming furnaces, applicable to boilers. (A communication.)

Dated 10th June, 1857.

1622. Frederic Koehler, 3, Finsbury-place—Improvements in gunpowder.

Dated 16th June, 1857.

1676. Charles Bernard Ochin, 16, Place Royal, Paris—Improved metallic roofing slates.

Dated 23rd June, 1857.

1748. William Symons, Dunster, Somerset—Improved means of communication between the passengers and guards of railway trains.

Dated 14th July, 1857.

1954. Henry Hebblethwaite, William Shuttleworth, and William Tasker, Halifax, Yorkshire—Improvements in preparing yarns for, and in machinery or apparatus employed in printing yarns for, carpets or other similar fabrics.

Dated 15th July, 1857.

1970. Henry Blandford, Sandridge Bromham, near Chippenham, Wilts—An improved combination of apparatus for distributing manure.

Dated 16th July, 1857.

1972. Wright Jones, Pendleton, near Manchester—Improvements in moulding for casting metals.
1976. Guillaume Defis, Marseille, France—Certain improvements in preventing incrustation in boilers.

Dated 18th July, 1857.

1991. William Cliff, Queen's Hotel, St. Martin's-le-Grand—A new system of applying the air from the bellows and other means to the forge. (A communication.)

Dated 22nd July, 1857.

2014. William George Armstrong, Newcastle-upon-Tyne—Improvements in the mode of adjusting ordnance for fire by night and day.

Dated 29th July, 1857.

2064. Charles William Siemens, John street, Adelphi—Improvements in refrigerating and producing ice, and in apparatus or machinery for that purpose.
2066. Hartley Kenyon, Manchester—Improvements in the treatment of certain compounds of silica, alumina, sodium, or potash, and the application of such compound in the processes of printing, dyeing, tawing, paper-making, or in any other process in which the alumina of commerce is employed.
2068. William Edward Jones, Birmingham—Improvements in the manufacture of iron plates, such as boiler plates, plates for ship building, and other similar purposes, and also in machinery for the manufacture of such plates.
2070. George Hallen Cottam and Henry Richard Cottam, St. Pancras Iron Works, Old St. Pancras-road—Improvements in the manufacture of children's cots and metallic bedsteads.

Dated 30th July, 1857.

2072. William Stettinius Clark, 133, High Holborn—Improvements in kegs for holding gunpowder and articles of a similar nature. (A communication.)
2074. Samuel Coulson, Sheffield—Improvements in preparing solutions for coating with aluminium.
2076. Thomas Ivory, Edinburgh—Improvements in rotary and reciprocating engines.
2078. Henry Bauerrichter and Gustavus Gottgetreu, Charterhouse-square—Improvements in the arrangements or adaptation of stereoscopic apparatus, and in boxes or cases for containing the same.

Dated 31st July, 1857.

2080. Edward Evans, Holywell, Flint, and George Potts Roskell, Stockyn, near Holywell—Improvements in reaping and mowing machines.
2082. Henry Bernoulli Barlow, Manchester—Certain improvements in self-acting mules for spinning. (A communication.)
2085. Antoine Galy-Cazalat, and Adolphe Huillard, Paris—An improved apparatus for and mode of manufacturing sulphuret of carbon, animal charcoal, and carbonic acid.
2086. Thomas Markland, Hyde, Chester—Certain improvements in power looms for weaving.
2088. William Garnham, 5, Bedford-terrace, Upper Manor-street, Chelsea—Improvements in pumping apparatus.
2090. John Beale, East Greenwich—An improved construction of rotary engine, applicable for pumping and measuring fluids, or for the production of motive power.

Dated 1st August, 1857.

2092. Charles Avril, Paris—Improvements in the mode of forming the printing surface of blocks, plates, cylinders, lithographic stones, or other similar bodies made use of for printing in colours.
2093. Richard Coleman, Chelmsford—Improvements in implements for ploughing, hoeing, and scarifying land, and in agricultural steam engines used for the traction of such implements.
2094. Guillaume Felix Aroux, 39, Rue de l'Echiquier, Paris—Improvements in seed drills.
2096. Edwin Maw, Doncaster Iron Works, Yorkshire—Improvements in constructing railway crossings, points, and switches.
2098. William Hopkinson, Huddersfield—Certain improvements in steam engines.
2100. Richard Archibald Brooman, 166, Fleet street—Improvements in circular sawing machinery. (A communication.)
2102. John Gray, Hill-street, Peckham—Certain improvements in doors for furnaces and fireplaces.

WEEKLY LIST OF PATENTS SEALED.

August 21st.

511. John Barber.
513. John Turner.
519. Auguste Quidde and Chas. Mayet.
525. Francis Coniliane La Croix.
526. Guiseppe Devincenzi.
527. James Edward Shearman.
528. John Kirkham.
534. George Barnett.
537. Rd. Archibald Brooman.
567. Joseph Slatterie Edwards.
595. Rd. Archibald Brooman.
596. Henry Duncan Preston Cunningham.
603. William Pedder.
629. Robert Mair.
631. Gerard Ralston.
642. Jean Louis Frédéric Bardin.
659. Luke Barton and Edwin Stanley Brookes.
799. James Edward Cole.
1481. James Edgar Cook.
1547. Stanislaus Hoga.
1635. William Edward Newton.
1695. Frederick Warner.

August 25th.

577. Edward Mucklow.
579. William Henry Thornthwaite.
581. Samuel Draper.
585. Edgar Heale and Mary Ann Heale.
633. William Hartley and Thomas Hardman Farrar.
931. Thomas Craddock.
1019. John Matthews.

Patents on which the Stamp Duty of £50 has been Paid.

August 17th.

1837. John Grist.

August 19th.

1853. Matthew Curtis, William Henry Rhodes, and John Wain.
1872. John Gedge.
1884. John Gray.

August 20th.

1835. Wm. Henry Smith, M.D., Henry Bessemer, and Robert Longsdon.
1851. John Norton.
1154. Aristide Balthazard Bérard.
1856. Julien Louis Pierre Jean Baptiste Hector Bouvet.
1894. Pierre Amable de Saint Simon Sicard.

August 21st.

1873. William Smith and Thomas Phillips.

August 22nd.

1846. James Lamb Hancock.
1860. Thomas Hayter.

Journal of the Society of Arts.

FRIDAY, SEPTEMBER 4, 1857.

◆

ON CHINESE POISON.

By D. J. Macgowan, M.D., of Ningpo.

In consequence of the atrocious attempt of the Cantonese to poison the foreign community at Hong Kong, applications have been to us from various quarters for information on poisons known to the Chinese. An investigation of Chinese toxicology would require much time and special study, which we despair of being able to devote to that interesting subject. In default of presenting anything of value to the scientific inquirer, we submit for the perusal of the general reader the limited information we possess on Chinese poisons. From the period of the Han dynasty to the present day poisoned arrows have been employed both in the chase and in warfare; less, however, by the Chinese proper than by the so-called aborigines, or Miautsz'. In the hands of the latter, they are formidable weapons. Instant death is inevitable from the slightest abrasion. The Chinese possess no agents for counteracting the poisons of the hill tribes;—the *Pun Tsua* states that these Inner Barbarians apply borax sometimes with success to poisoned wounds; and it is commonly reported that for their various virulent poisons they possess perfect antidotes.

We are acquainted with only one of the inoculating poisons of the Chinese—a watery extract of the root of the *tsau-wú*—a perennial creeper found on the hills of the central provinces. Its botanical character, as well as its precise physiological action, we have yet to ascertain. Its active principle appears to be highly volatilizable and great exactness is needed in preparing it. Small animals are kept in readiness for testing the strength of the extract; they are punctured with a point charged with the poison; and when its virulence is sufficient to occasion instant death, it is boiled no longer. A native physician who saw it prepared by the hunters of the adjacent district of Funghwa, states that sometimes they prick their arms to let blood flow to the wrist, and after carefully wiping the part near the wound, apply some of the pasty extract to the lower end of the line of blood, which it rapidly blackens through its whole length; and it is affirmed, that were the continuity with the incision unbroken, the morbific action of the subtle agent would penetrate the wound and prove quickly fatal. It is sometimes applied to the tongues of the unwary as a practical joke—when it occasions a keen sensation of formication. The dried root is administered where the nerves of motion are impaired. The Funghwa hunters traverse in winter the mountainous regions of Chihkiang in pursuit of tigers that are sometimes taken by being pierced with arrows, the necks of which are bound with filaments of cotton saturated with the poison; at other times, springs charged with these arrows are adjusted to the lair of the animal for its destruction. When a limb is struck the beast writhes awhile before expiring, but when wounded in the body, he leaps forward, staggers and falls dead immediately.

Attached to the imperial body guard is a corps of hunters, who, when on the chase in pursuit of edible game, provide themselves with envenomed missives to be employed against wolves.

Latterly, poisoned arrows have fallen into comparative disuse as implements of war, owing to an increasing familiarity with firearms. We are acquainted with the contriver of a machine which was designed to be used against the English during the late war. It succeeded so well in picking off goats which were led over the cords communicating with it, that the military commission strongly recommended its adoption for destroying barbarian bipeds. Unfortunately for the patriotic inventor, the treaty of Nanking caused the dispersion of the game just as it was, as he supposes, about to be largely bagged. It need hardly be added that in the hands of assassins this easily obtainable poison would prove a potent means of destruction; as a slight puncture of an instrument charged with it, would, from its rapid absorption, be a sure *coup de grace*.

It is not our purpose to point out all the virulent agents which unscrupulous Chinamen are likely to employ against an enemy. We shall only add one more of the inoculating class, and that chiefly on account of its novelty. When the late commissioner Lin was devising means for the extirpation of English barbarians at Canton, some of the gentry of that city actually proposed to H. E. to rid the place of certain prominent and obnoxious individuals by infecting them with *leprosy*.

Lin indignantly rejected the proposition, as unbecoming a civilized people. That Chinese statesman was a brave and honourable man; his present Nanchu successor has no claim to such virtues. His chief objection to the use of leprous virus would be, it is said, the tardiness of its action; it is believed that more than a month elapses, after the introduction of the animal poison, before it begins to show itself in its victim. Our knowledge of this foul malady is too imperfect to justify us in pronouncing such an inoculation as impracticable. Nor have we any remedy to propose for an officer who finds himself thus tainted. However, the gallant sufferer, though invalided, would be far from being unserviceable. If the everyday people of his acquaintance shun him, his society would, on the other hand, be courted by the *elite* of the medical profession, and to a public spirited practitioner of the art of war, it ought to be consolatory to know that pathological science would derive more advantage from observations on his case, than would be afforded by the cadavers of a whole mess.

There are poisons also which are *inhaled*. A person who aided a magistrate in the administration of a poison of this class gives the following narrative of the transaction, which was a *filiacide*. (Our apology for coining this word is, that it is needed to denote a crime, or rather extra-judicial practice not uncommon in China, resorted to for making away with dangerous adult sons.) The son of that officer was a lawless and incorrigible character, who, by misdemeanours, perilled the safety of his family, and they determined on his removal. To effect that object without publicity, no small finesse was requisite on the part of his father and friends. Suspecting their designs, he became excessively wary; on the day agreed for his execution, the father feigned to be withholding the son's much-loved opium, until he could induce the hapless youth to take a draught of tea, which he was artfully led to suppose was drugged. At length, affecting to be wearied by the son's contumacy, the father gave him his opium pipe, mixing with the genial papaver another drug intensely venomous. After a few inhalations the victim fell into a stupor, which was followed by convulsions, to which his athletic frame succumbed in less than six hours. Lest it be thought that, in publishing an account of this smokable poison, we are fulminating an insidious "counterblast" against tobacco, we would state that few, except the mandarins, are in possession of the secret; or, if there is no comfort in that to the lovers of cheroots, we add that, unlike arsenic, this noxious agent renders dying tolerably easy.

To the same class belong those drugs which are employed by burglars for stupefying the inmates of the house to be robbed. Ever since we read in Commissioner Lin's anti-opium diatribe, references to medicines used by robbers, kidnappers, and sorcerers, which that statesman compared to the prohibited narcotic, we have been vainly endeavouring to investigate their nature. There is, however, abundant evidence that such agents are employed to induce stupor for criminal purposes.

Kidnapping male children for sale in Siam or the Straits has long been a common practice on the seaboard, and, a short time since, to meet the demand for Chinese females in Cuba, many girls were kidnapped. The provincial capital, Hangchau, was thrown into consternation in consequence of the paucity of slave labour in the West Indies. Popular placards and official proclamations were posted everywhere, warning the inhabitants against the villainous agents of foreign barbarians, who were prowling in search of female children. Two miscreants were detected with their little prizes, and immediately beaten to death. From the documents published on that occasion, it appears that, for very young children, a drug is employed, which, on being applied to the face, produces a degree of insensibility, enabling the operator to lead the little one away unresistingly. For those of a larger growth, as well as for adults, something is given, which, by irritating the throat, causes aphony. At other times they seem to employ an anæsthetic for criminal purposes.

We must adduce one instance of a proposal to stupify by drugs of this character. When Ningpo was in possession of the English, a bold effort was made for its re-capture by surprise. A large number of "braves" were secretly housed in the city, and, a few hours before the time appointed for rising, the mandarins sent, for distribution among a portion of the concealed force, a quantity of stupefying drug in the form of pastiles. Arrangements were made for a simultaneous attack on the west and south gates by night, and, while some of those within the city were to set off noxious vapour in houses occupied by the English—others were to force open the gates. The plot failed through the dilatoriness of the fumigating squad. They arrived too late. The noise of the attack aroused the English, and its partial success enabling a large force to enter the city, caused a dreadful carnage among the spirited assailants. Yet their confidence in the utility of fumigation was not impaired; for it was not long after that a barbarian soldier was captured by this means, and beheaded. Many were the plans set afoot for the capture of the English chief, *Pu-ting-ché*, for whose head ten thousand taels were offered. At the present juncture our friends in the South, whose heads are of any particular value—we mean in the Chinese market, would do well to keep their eyes open.

It is said that not far from every poison its antidote may be found. These soporific pastiles come within that rule. The difficulty in poisoning cases is to know where to look for the desired neutralizer. That our toxicological notes may not be wholly devoid of practical information, we shall give some simple directions for the guidance of those whose premises are invaded by fumigators. It is assumed that you are wide awake at the time, for if you are caught napping there is no remedy. In the first place then, take care that you do not bawl out. Shut your mouth. Hold your breath. Rush at the intruder—sieze his tail in your left hand and with the thumb and index finger of the right, lay hold of his nose just above the alae with a firm grip, and a bolus will plump out of each nostril with which you are to plug your own nasal passage (do not be fastidious), and you may then commence breathing (your mouth still closed)—for these medicated pledgets possess the property of decomposing the somnolent gas. If successful in these manipulations you will have the gratification of seeing your foe gasp and tumble over *hors de combat* into the pit he had prepared for you. Allusions are often made to a mysterious and extremely virulent poison taken by men of high rank when on the eve of execution: it is derived, according to vulgar belief, from a protuberance on the head of a species of stork. Whatever the agent may be, it is unquestionably one of great potency. An officer who was eye-witness to the decapitation of the venerable and lamented general Yu Tsien, informs us that when that victim of Manchu malignancy was led out to slaughter, something was placed on the tip of his tongue, which without the infliction of pain rendered him insensible in less than half an hour. Friendly mandarins then retained his moribund frame in an erect posture to receive the painless death-blow.

Nearly all the vegetable and mineral poisons known in the West are found in China, and have been employed for homicidal or suicidal purposes. Laurel water, hemlock, hyascimus, belladonna, stramonium, and nux vomica and a long list of other indigenous plants known and unknown are always at hand, though not often employed, owing to the facility of obtaining opium. Dogs are often poisoned by thieves, who give them rice in which nux vomica has been boiled. It is not an uncommon practice for countrymen to throw an infusion of croton tiglium into a pond, a mode of fishing made easy:—the morning following the operation every fish is found floating on the surface, dead. They are taken to market, but though somewhat insipid are innoxious. Some species of fish found on the coast, it should be added, are intensely poisonous, as of course are several kinds of mushrooms, which with other edible poisons are employed by those who aim at robbery or murder. For suicide, after opium, the most common agent is the sediment of brine—which is highly corrosive. Pure gold is not uncommonly used; it probably acts in the same manner. Quicksilver has also been used for the same purpose; we are uninformed respecting its action. Arsenic, although cheap and abundant, is not easily procured, vendors being held responsible for consequences, whether suicide or murder. The yellow, or sesqui-sulphuret (*orpiment*) abounds in Kungchang in the S.W. of Kansuh. It is employed externally to venomous wounds; as a sternutatory to counteract miasmatic effluvia in summer, and internally as a tonic in several diseases, and as a paraphylactic. On the fifth day of each fifth month, persons of every age and condition drink spirituous liquor in which some powdered orpiment has been thrown, under the belief that it is preventive of epidemic diseases. The Chinese do not consider this mineral as related in any way to arsenic. By arsenic they mean the red or proto-sulphuret (*realgar*). This mineral is found abundantly in Sinyang—Honan; arsenious acid (*white oxide*) is also met with, a collateral product, it is said, in some glass work, derived doubtless from an ore of cobalt. The sulphurets were known to the ancient alchymists of China, and were early employed in medicine; the utility of the last named in intermittent fever has not been long known, says the Pun Tsau—Materia Medica. Water in which common green bean has been boiled and pounded, is given in cases of arsenic poisoning. It can be of use only as a demulcent. We are told that Mongolian hunters beyond the wall eat it to enable them to endure cold when patiently lying on the snow to entrap martens. In this part of China arsenic is taken by divers, who in cold weather plunge into still water in pursuit of fish which are then found hybernating among stones at the piers of bridges. We perceive with regret, that the modern Chinese have added arsenic to their habitual stimulants. The red sulphuret in powder is mixed with tobacco, and their joint fumes are smoked in the ordinary manner. We have met with no habitual smokers of this compound of mineral and vegetable poisons, but persons who have made trial state that dizziness and sickness attend first attempts. After a few trials arseniated tobacco may be taken without any apparent inconvenience. From reports given of it, we infer that its effects on the Chinese are analogous to what is observed among the arsenic eating peasants of Austria. The use of arsenical vapour by inhalation merits the attention of physicians as a remedial agent.

At Pekin, where arseniated tobacco is most in use, it costs no more than the unmixed article; it may be known by the red colour imparted to the vegetable by the powdered proto-sulphuret. Its introduction is attributed to Cantonese from Chauchau. If this be correct, it is probable that these Southerners, unable in the North to procure the muscatory to which they are addicted, sought to appease a craving for the pungent but harmless lime and betel-nut, by substituting the deleterious mineral gas. Many of the miserable victims of opium, to whom that narcotic is a necessity and not a pleasure, have eagerly employed the new stimulant to prop and exhilarate their exhausted bodies, and perhaps have thereby ameliorated and prolonged their existence. We would fain hope that the use of arsenical stimulants will not become general; yet that pernicious custom is extending, and we know our race too well not to entertain fears on the subject. It is even stated that for a time at least, the reigning emperor in his boyhood preferred tobacco thus mineralized. Arsenical ores are used in the arts. In domestic economy the red sulphuret is employed for making away with rats and husbands.

There is no evidence that poisoning as an art has been practised in China, and we search her annals in vain for a case parallel to that of Hong Kong. Novelists sometimes describe the poisoning of armies or large numbers of people—the account of the aboriginal chief Manghwoh, who poisoned the springs of which the Chinese army drank, will recur to the reader of the historical romance "The Three States." It may be that instances of this kind are founded on fact; but the obvious futility of any attempt to poison fatally on a large scale is a guarantee that it will be seldom resorted to in warfare. Could such appliances be made subservient to the destruction of masses of men, they would certainly be put in requisition, as total annihilation of antagonists is always the aim of Chinese heroes. "No quarter" is their war cry and "peculiar institution."

NATIONAL ASSOCIATION FOR THE PROMOTION OF SOCIAL SCIENCE, 1857.

This Association, of which Lord Brougham is president, and the Mayor and Recorder of Birmingham vice-presidents, will hold its first meeting at Birmingham, on October 12th and the four following days.

The object of the Association is to aid the development of the social sciences, and to guide the public mind to the best practical means of promoting the amendment of the law, the advancement of education, the prevention and repression of crime, the reformation of criminals, the establishment of due sanitary regulations, and the recognition of sound principles in all questions of social economy.

The proposed mode of action is, once in every year, to bring together the various societies and individuals who are engaged or interested in furthering any of the above objects, and, without trenching upon their independent exertions, to elicit by discussion the real elements of truth, to clear up doubts, to harmonise discordant opinions, and to afford a common ground for the mutual exchange of reliable information on the great social problems of the day.

The better to carry out this plan, the Committee have divided the Association, for the present, into five departments, viz., Jurisprudence and Amendment of the Law, Education, Punishment and Reformation, Public Health, and Social Economy; but, at the time of each meeting, any department will, if necessary, be sub-divided into sections, for the more convenient transaction of its business. A committee has been appointed for each section.

Full particulars of the business to be transacted in each department will be published previous to the meeting, but, in the meantime, and in order more fully to explain the range of topics on which papers and discussion will be received, a short statement is subjoined under the head of each section.

The Department of Jurisprudence and Amendment of the Law is under the presidency of the Right Hon. Lord John Russell, M.P., and will be occupied in discussing the science of civil jurisprudence; its bearing on the social condition of the people, the advantages derivable from a wide diffusion of its principles; the practical defects in our laws; the evils arising from such defects; and the fitting remedies.

The Department of Education is under the presidency of the Right Hon. Sir John S. Pakington, Bart., M.P., and will deal with the various questions relating to education, both industrial and intellectual, whether of the upper, middle, or lower classes of society; the foundation schools of the country; the connection of art and literature with national education, &c.

The Department of Punishment and Reformation is presided over by the Bishop of London, and in this section will be discussed the various questions relating to the prevention and repression of crime; the reformation of the criminal; the best mode of secondary punishment; prison discipline; the management of reformatory schools and institutions, &c.

The Department of Public Health, of which Lord Stanley M.P., is president, will be occupied with the consideration of the various questions relating to the public health and the prevention of disease; it will collect statistical evidence of the relative healthiness of different localities, of different industrial occupations, and generally of the influence of exterior circumstances in the production of health or disease; it will discuss improvements in house construction (more especially as to the dwellings of the labouring classes), in drainage, warming, ventilation; public baths and wash-houses; adulteration of food and its effects; the functions of government in relation to public health, the legislative and administrative machinery expedient for its preservation; sanitary police, quarantine, &c.; poverty in relation to disease, and the effect of unhealthiness in the prosperity of places and nations.

The Department of Social Economy is presided over by Lord Lyttelton, and in this section will be considered the various questions relating to social economics; the conditions of industrial success, whether of nations or individuals; savings banks and insurance; the relation between employers and employed; strikes and combinations; legislative interference with the hours and wages of labour; legislative regulation of professions, trades, and employment generally, and of price and means of supply; emigration, its effect, and true conditions; exercise of public and private charity; relief of the poor; industrial employment of women; industrial and economical instruction of the labouring classes; social economics in relation to education, &c.

All papers and communications are to be addressed to the General Secretary, G. W. Hastings, Esq., 3, Waterloo-place, London, S.W., and must be sent in at least one week before the 12th October. The General Committee of the Association, as well as the Committee of each Department, reserve the right of rejecting any papers which they may consider inappropriate.

It is particularly requested that no paper may occupy in reading more than twenty minutes at the most.

The following are the arrangements for the meetings:—

Monday, October 12th.—Opening meeting in the Town-hall, at half-past seven in the evening. Lord Brougham will deliver an inaugural address.

Tuesday, October 13th.—The several departments will meet in the Queen's College, at eleven o'clock a.m., for papers and discussions. In the evening, a conversational meeting (dress) at the Town-hall, under the presidency of the Mayor of Birmingham.

Wednesday, October 14th.—Departments at Queen's College at eleven a.m. A dinner in the evening at Dee's Hotel, to Lord Brougham and other members of the Association, by the Mayor of Birmingham.

Thursday, October 15th.—Departments at Queen's College, at eleven a.m. In the evening a public meeting in support of the Reformatory and Industrial Schools movement, at the Town-hall.

Friday, October 16th.—Concluding meeting, to receive a report from the General Committee, at twelve.

A reception room will be open during the days of the meeting, where letters may be addressed, tickets purchased, lists of lodgings obtained, and every information given.

Tickets to admit to all the meetings, ten shillings each.

Members of the Association (subscription one guinea annually) admitted free.

By the permission of the Hon. and Rev. Grantham Yorke, a special service for the occasion will take place at St. Philip's Church, on the afternoon of Monday, the 12th of October.

REPORT OF THE COMMISSIONERS OF PATENTS FOR 1856.

The Commissioners of Patents appointed under the Patent Law Amendment Act, 1852, (15 and 16 Vict., c. 83,) in compliance with the terms of the third section of that Act, make the following Report of their proceedings under and in pursuance of the same, for the year 1856, in continuance of their report of proceedings for 1855.

The number of applications for provisional protection recorded within the year 1856, was 3,106; the number of patents passed thereon was 2,094; the number of specifications filed in pursuance thereof was 2,048; the number of applications lapsed or forfeited, the applicants having neglected to proceed for their patents within the six months of provisional protection, was 1,012.

The number of applications recorded within the first six months of the current year (1857) was 1,830; therefore, an increase of about 600 on the whole year, as compared to the number of the year 1856, may be expected.

The Act 16 Vict., c. 5, enacts that all letters patent for inventions to be granted under the provisions of the Patent Law Amendment Act, 1852, shall be made subject to the condition that the same shall be void at the expiration of three years and seven years respectively from the date thereof, unless there be paid, before the expiration of the said three years and seven years respectively, the stamp duties in the schedule thereunto annexed, viz., £50 at the expiration of the third year, and £100 at the expiration of the seventh year, and the Act, in respect of the first payment of £50, came into operation on the 1st of October, 1855.

Two thousand and thirty-three patents bear date between the 1st of July, 1853, and the 30th of June, 1854; the payment of the additional stamp duty of £50 has been made on 584 of that number, and 1,449 have become void by reason of nonpayment.

All the provisional, complete, and final specifications, filed in the office upon the patents granted under the Act, have been printed and published in continuation, with lithographic outline copies of the drawings accompanying the same, and within three weeks of the respective dates of filing, according to the provisions of the Act 16 and 17 Vict. c. 115.

The provisional specifications filed in the office and lapsed and forfeited, have also been printed and published in continuation.

Printed certified copies of the specifications filed in the office, as also certified copies of patents, and of the record book of assignments of patents and licenses, with copies of such assignments and licenses, have been sent, in continuation, to the office of the Director of Chancery in Edinburgh, and the Enrolment Office of the Court of Chancery in Dublin, pursuant to the Act of 1852 and the Act of 16 and 17 Vict. c. 115.

The work of printing the specifications of patents enrolled in Chancery previous to the Patent Law Amendment Act (1852), 12,977 in number, the first dating October, 1711, was commenced in September, 1853. It was proposed to print at the rate of from 1,500 to 2,000 in each succeeding year, but the work has proceeded with much greater expedition; 8,362 of these specifications have been printed, together with the drawings; 400 are now in the hands of the printer and lithographer, and the whole work will be completed before the end of the year 1858.

Balance Sheet of Income and Expenditure, for the Year 1856.

RECEIPTS.

	£	s.	d.
In stamp duties in lieu of fees*	91,115	16	2
By sale of prints of specifications, indexes, &c.	1,361	10	0
Surplus income on balance of accounts, from the 1st October, 1852, to the end of the year 1855	3,648	16	1
	96,126	2	3
Surplus income	13,678	11	6

PAYMENTS.

	£	s.	d.
Fees to the law officers of England	8,761	4	0
Their clerks	777	5	0
Salaries of officers and clerks in the Commissioners' office	4,314	10	0
Compensations	4,584	0	0
Current and incidental expenses in the Commissioners' office†	5,850	5	3
Estimated cost of stationery supplied by Her Majesty's Stationery Office, books for the Free Library established in the Patent Office, and binding	1,164	12	8
Rent of offices and library	490	0	0
Messrs. Eyre and Spottiswoode, for printing specifications of patents, indexes, &c.	14,029	18	5
Lithographers' bills for drawings accompanying specifications	21,156	6	6
Estimated cost of paper supplied to printer and lithographer by Her Majesty's Stationery Office	4,634	13	9
Revenue stamp duty account as below‡	16,685	0	0
	£82,447	10	9

	£	s.	d.
* 3106 petitions for grant of Letters Patent, at £5 each	15,530	0	0
2342 notices of intention to proceed with application, at £5 each	11,710	0	0
61 notices of objection to the grant of Letters Patent, at £2 each	122	0	0
2,097 warrants for patents, at £5 each	10,485	0	0
2,094 patents sealed, at £5 each	10,470	0	0
2,048 specifications filed, at £5 each	10,240	0	0
495 entries of assignments of patents and licenses, at 5s. each	123	15	0
530 searches and inspections, at 1s. each	26	10	0
13,027 folios of office copies of documents, at 2d. per folio of ninety words	108	11	2
618 patents upon which the progressive stamp duty of £50 has been paid	30,900	0	0
1 patent on which the progressive stamp duty of £100 has been paid	100	0	0
72 patents granted under 53rd section of the Act, on which the progressive stamp duty of £16 13s. 4d. has been paid	1,200	0	0
13 new patents granted upon Her Majesty's Order in Council, under the 40th section of the Act, being prolongations of patents granted previous to the Act, at £5 each	65	0	0
7 duplicate patents issued in lieu of original patents lost or destroyed, at £5 each	35	0	0
	£91,115	16	2

SOUTH KENSINGTON MUSEUM.

During the week ending 29th August, 1857, the visitors have been as follows:—On Monday, Tuesday, and Saturday, free days 3,126; on Monday and Tuesday, free evenings 6,340. On the three students' days (admission to the public 6d.), 470; one students' evening, Wednesday, 107. Total, 10,039.

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† Paid for two copies of Gazettes for the use of the office, binding specifications, catalogues of books for library, and translating titles of foreign specifications, &c.	292	10	1
Paid office keepers, carpenter's bill for packing cases for specifications, &c., sent to public offices in Edinburgh and Dublin, chimney sweep, &c.	158	5	11
Paid for coals, candles, gas, &c.	93	4	0
Postages, porterage, and sundries	67	14	6
Paid for 2,119 tin boxes, to hold the impressions of the Great Seal attached to the patents, at 1s. each	105	19	0
Paid the sealer of the Court of Chancery for wax expended by him upon 2,116 impressions of the Great Seal	158	13	6
Paid to the law stationers employed by the Commissioners for copying, out of the office, at the rate of three halfpence for every ninety words, and for writing clerks employed in copying in the office, and paid by time	4844	15	5
This charge stands in the place of the salaries of thirty or forty copying clerks, which number of clerks must otherwise have been placed upon the establishment of the office, in addition to the nine clerks permanently appointed.			
The documents copied consisted principally of specifications of patents and provisional specifications for the printer, mostly of great length; copies of indexes for the printer; office copies of specifications, patents, and other records, made for persons applying for the same, the fees thereon being paid in stamp duties; office copies of patents sent to the public offices in Edinburgh and Dublin pursuant to the Act; three copies of each deed of assignment of a patent or licence of patent right recorded in the office pursuant to the Act, one copy of the record books of the office, the other two for the public offices in Edinburgh and Dublin, and two copies of the record book for the same offices in Edinburgh and Dublin. These assignments and licence deeds are, with few exceptions, of great length, and the fee of 5s. on recording each deed is paid in a stamp duty; copies of notices for Gazette, and various other records and documents.			
Paid the lithographers employed by the commissioners, for lithographic forms, &c	129	3	0
Consisting of forms of certificates of allowance of provisional protection, notices to proceed, notices of objections, forms for patents, for the warrants of the law officer, and for transcripts of patents, &c.			
	5850	5	6

‡ The Act of 1852, in lieu of the old duties upon patents, imposed a revenue stamp duty of £5 upon the warrant of the law-officer, £10 upon the certificate of payment of the progressive fee of £40 at the expiration of the third year, and £20 upon the certificate of payment of the fee of £80, at the expiration of the seventh year of the patent. The Act of 1853 (16 Vict. c. 5) converted all the fees imposed by the Act of 1852 into stamp duties. The revenue stamp duty account for the year 1856 is as follows:—

	£	s.	d.
2,097 warrants of the law officers for patents, at £5 each	10,485	0	0
618 patents on which the progressive duty of £50 has been paid at the end of the third year from their respective dates (£10 being revenue stamp duty, and £40 fee stamp duty); 618 at £10 each	6,180	0	0
1 patent on which the progressive duty of £100 has been paid, £20 revenue stamp duty, and £80 fee stamp duty	20	0	0
	£16,685	0	0

THE CULTIVATION OF COTTON.

The following letter has been addressed to the Editor of the *Manchester Guardian*:—

SIR,—Letters upon the cotton question pour in from all quarters, and almost everyone can tell us where we may get it, but few set about doing it. I would rather see one bale of cotton from a new country than a thousand letters and speeches. Your correspondent *Anti-Slavery*, however, says it is useless now to look to India for a supply, and he sees no grounds for expecting it from Africa; and whilst he holds up Jamaica as the place from which to supply our wants, and states that there is much labour available for cotton cultivation there, he immediately cries out for an importation of Africans for that purpose. Your correspondent *Lex* holds up Australia as a cotton field, but says it would have to be confined to the Sea Island quality, on account of the same want of labour. *A Stranger*, apparently also in the Jamaica interest, asks for £30,000 to be raised, and estimates that 20 per cent. profit may be realised. I would not disparage any cotton field, nor discourage any rational scheme, but rather lend a helping hand, so far as possible, to all. One correspondent says that four or five years ago a great stir was made in Jamaica, and cotton grown by many persons on a small scale, but that when the cotton was ripe, as they had no gins to clean or presses to pack it, and the quantity in individual cases was too small to ship on their own account, and as no capitalist took it up, the movement was abandoned. For his encouragement, therefore, I will undertake to purchase at its market value, clean, pack, and ship, in any quantity, such experimental lots of cotton as before could not be sold, and shall be obliged if he will at once put me into communication with the planters. In answer to *Anti-Slavery* not expecting cotton from India or Africa:—First; I believe he is wrong in not expecting it from India, for I view the present outbreak as only a temporary derangement, whilst it is evidently a crisis that will ensure the future better government of India, either by the forfeiture of the charter or otherwise. Why is it that fewer than 400 Europeans, besides officials, are settled amongst a population of their fellow-subjects of upwards of 130,000,000 in India, and that neither capital nor enterprise flow in that direction? Next I would say a word for the African. Almost wherever cotton will grow the cry is, send us the African to cultivate it; and perhaps in no other country except India is there labour on the spot in any abundance. Africa, like India, is the home of the plant as well as the planter. Dr. Livingstone found it abundant in the east; from the west I am getting it now rather largely; at Tunis, on the north, I and others have just established a company; on the south also cotton abounds, and I am attempting to introduce the system that has succeeded so well in the west.

Africa is as prolific in population as in the produce of the soil; the inhabitants are so industrious and docile, that the kidnappers of the world wish to steal and possess them. And as we have, at great sacrifice of time and money, set free great numbers of Africans at Sierra Leone, where at least 150 languages are spoken, besides innumerable dialects; and as these men and their children are educated in missionary schools, and are gradually working their way back to their own country; and as it is supposed that something like 100,000 have already settled at Abeokuta, on the very borders of the great Youroba cotton district, where Mr. Consul Campbell says 70,000,000 lbs. are annually consumed by them in their own domestic manufactures; and as they are all anxious for employment, are industrious and keen traders, having seen the advantage of it at Sierra Leone,—why should we not encourage them to cultivate cotton, palm oil, ground nuts, arrowroot, and a thousand other articles that their own country abounds with, and which they are willing to supply? Let us insist on their enjoying that freedom and liberty which our money and cruisers have so nobly entitled them to. An expedition has been arranged which will go up the Niger twice every year, for five years, once yearly at the risk of the contractors.

The Benin and Brass Rivers, as well as Lagos and Abeokuta, will be important stations.

Good cotton, equal to average American, can be bought in the seed at	$\frac{1}{2}$d. per lb.
4lb. of which will make 1lb. of clean cotton	2d. per lb.
It can be cleaned at the rate of 30lb. for 4d. or $\frac{1}{8}$d. per lb., say	$\frac{1}{4}$d. per lb.
Packing and canvas	$\frac{1}{2}$d. per lb.
Carriage and charges on board	$\frac{1}{4}$d. per lb.
Freight to England	1d. per lb.
Charges in England	$\frac{1}{4}$d. or 4$\frac{1}{4}$d. per lb.

Which is at this moment worth 8$\frac{1}{4}$d. to 8$\frac{1}{2}$d. in Liverpool.

Under the guidance, and with the advice of the Rev. H. Venn, the Native Agency Committee, and Church Missionary Society, I have been enabled to send out 119 cotton gins—have five more ready, and 50 coming in, making 174 in the whole, besides one horse gin, two boats, and other matters.

The Native Agency Committee have provided and sent out one hydraulic, and three large screw packing presses, and a resident trader has just ordered another, and sent upwards of £80 worth of palm oil to pay for it.

Government has undertaken several important works in India, and is rendering very valuable assistance in various parts of the world, at the request of the Cotton Supply Association. The association is working energetically, as well as judiciously, is doing great good, and deserves both general and liberal support.

I have received at Lagos, from the interior of Africa, since Christmas last, from 500 to 600 bales of cotton, notwithstanding two large fires, in which great quantities of cotton have been consumed, and although the attention of the chiefs is again taken from the cotton work by intestine wars, which are said to be fomented by parties who wish to destroy the rising trade in cotton.

Let spinners and others, therefore, who are anxious to increase our cotton supplies, send out agents to buy it in Africa, and encourage a trade, which, in my opinion, is destined, at no distant period, effectually to relieve our wants, and supersede slavery.

To those who prefer India, or any other part of the world, I equally say, make arrangements to bring it, and thus save many from ruin and want. I have now to apologise for the length of this attempt to produce action, instead of talking and writing.—I am, &c.,

THOMAS CLEGG.

Manchester.

Home Correspondence.

SUBMARINE TELEGRAPHY.

Sir,—What with Indian affairs and the failure of the Atlantic cable, the public mind is much engaged with this subject, as yet but imperfectly understood. The vulgar notion seems to be, that one telegraph system is as good as another for all or any circumstances whatsoever they may be; that what is success in one case must of necessity be so in another, although widely different. It is not so, as has already been too frequently proved, and with a disgraceful loss of capital. What will do for 100 miles in shallow water is totally inapplicable to 1,000 miles in deep water.

A correspondent in the *Times* of the 18th, with hasty eagerness, suggests that a portion of what is saved of the Atlantic cable be forthwith purchased by Government, and laid between Malta and Alexandria. Before any further bungling takes place, or the Government be seduced to enter into such a transaction and lay such a line, which will be safe only in the sense of the Irishman's kettle, viz., that it is at the bottom of the sea, it is but right to state that such a cable as has been constructed for the Atlantic Telegraph Company, without a very considerable outlay upon it, is as unsuitable for the Mediterranean as it is for the Atlantic, and for the simplest of all reasons—its specific gravity. It is, therefore, a mere stubborn throwing away of money, persisting to attempt the laying of ropes constructed on such principles in the depths of the Atlantic or Mediterranean. Judging from past experience and the philosophy of common things, the chances of success are very remote indeed, and as the *Times* of April 22nd plainly states, "If it (the Atlantic cable) does answer temporarily, it will not be due to the plan on which it is made, but in spite of it."

The recent and previous failures are strongly corroborative of a statement published by me as far back as 1853, as to the requirements of an ocean telegraph, which was referred to in the *Times* (City article) October 28th, of that year, experience since only confirming the premises.* The following is an extract:—

"It is almost unnecessary to observe that the various telegraphic arrangements at present in operation are quite inapplicable to a line of communication extending across the Atlantic—the instruments as well as the mode of obtaining the electro-motive force being quite inadequate to such an undertaking. But, even assuming that these means were sufficient, the weight of the submarine conductor, as at present in use, would involve so large an outlay in manufacture, and so much hazard and expense in laying, as to render it doubtful if such could ever be completed.

"To carry this great work into effect, it is necessary, in the first place, to have such a conductor as can be made at a moderate expense, and of such a weight that it may be laid with as little risk as possible, and, secondly, to employ such instruments and means of obtaining an electro-motive force as are capable of working throughout so extensive a circuit.

"It is therefore proposed—instead of the copper wire insulated with gutta percha, and with its casing of iron—to use a submarine conductor of iron alone, insulated with a material of sufficient flexibility, but, at the same time, possessing such hardness and strength as to meet all the requirements of the case.

"The reasons for adopting this new principle, in addition to that already stated, are:—

"First.—Conductors so formed need only weigh from a half to a ton a mile, instead of two, six, or eight tons, as those at present laid, thus bringing the items of weight, as well as cost, according to circumstances, within a comparatively small amount.

"Second.—This conductor being in fact an iron rope, merely of sufficient strength to meet the circumstances of the case, enclosed in a material which will perfectly insulate, and, at the same time, protect it from the action of the water, can be easily handled and laid in one continuous line, both with less hazard, and at a comparatively small cost to that of the ordinary description of cable.

"The conducting power of iron is only about one-sixth that of copper; but, laying the question of strength and other circumstances aside, according as the sectional area of the wires composing the iron rope be increased, so will the conducting power obtained, by the principle upon which it is formed, be augmented, and this will be found to be three or five times greater, as the case may be, than that of the copper wire employed under the conditions in which it is used in the existing submarine cables.

"In addition to these advantages, the fact of only one metal being used, renders the conductor in a great degree independent of absolutely perfect insulation, as there is neither that tendency to charge the wire—which disturbs the working of the instruments—nor to making the short circuit, in the event of the insulation becoming imperfect, which, in submarine conductors on the present plan, is a defect that is always increasing.

"The electro-motive force by which it is proposed to work through so long a circuit is the "Induced Current," produced or obtained from an electro-magnet by induction.*

"The peculiar arrangements adopted in obtaining, as well as the mode of applying this electricity to the working of a form of telegraph suitable for the present object, have been practically tested, and found to be more peculiarly adapted than any others to the working of so extensive a circuit."

I am, &c.,
THOMAS ALLAN.

1, Adelphi-terrace, August 28th, 1857.

TELEGRAPHIC COMMUNICATION WITH INDIA.

SIR,—At present all eyes are turned towards India. Every taxpayer of the United Kingdom repeats to himself the pertinent queries of an Eastern correspondent, "Why are we so far from home? Why have we 9,000 miles between England and her Eastern dominions untraversed by a telegraph?" No one can read these queries without feeling somewhat of self-reproach as an integral part of the nation. What is pointed out now as a necessity was proposed years ago, and might ere this have been in active operation, but what can we expect when a national scheme of such vital importance meets with so cold a reception from the powers that be, as my Lord Palmerston vouchsafed to its consideration some short time back.

A telegraph to India is not simply a commercial speculation. The annihilator of time and space is in this respect an engine of government, and what nation requires it so much as our own, whose minor seats of government are scattered all over the globe.

In matters of government, nothing is so expensive as ignorance. The money thus wasted would make a telegraph a dozen times over. The single consideration ought to be, how the interval of time between Great Britain and India can be annihilated at the earliest possible moment.

A direct communication should be established from London to Bombay, by a chain of submarine lines from Falmouth, *viâ* Gibraltar, Malta, Alexandria, Suez, Aden, and Bombay. By a continuous and independent system, such as this, the cost of the message between the termini would not only be reduced to a minimum comparatively, but the expense, delays, and espionage of the foreign lines of telegraph across the continent of Europe would be entirely avoided, which of themselves would render any telegraph system of communication with India, based on their co-operation, practically valueless to the commercial community.

Telegraphic intercourse with the various stations *en route* is also of the highest importance, not only to the commerce, but to the Government of Great Britain. The whole line of communication from London to Bombay might be completed within a twelvemonth, at something under a million sterling.

I am, &c.,
THOMAS ALLAN.

1, Adelphi-terrace, August 28, 1857.

MECHANICS' INSTITUTION AT JERUSALEM.

RESPECTED FRIEND,—Having had the pleasure of accompanying my friends Sir Moses and Lady Montefiore in the visit which they have just paid to Palestine, for the purpose of furthering their benevolent objects in relation to the Israelites resident there, and more especially in Jerusalem, my attention was directed to the general state of that most interesting city, to the condition of its inhabitants, and to the influences which are or might be brought to bear on them.

A strong desire to promote the welfare and comfort of the people, and to bring about the cordial co-operation of different classes, which is necessary for Jews, Christians, and Turks, induced me, whilst there, to offer the subjoined suggestions.

As they were most kindly received by my friends of every class, I had the gratification before my departure to see a respectable meeting unite in the resolution to make the attempt to carry them into execution.

I believe that these facts may interest the patrons of Mechanics' Institutes in many parts of the kingdom, and if some should feel inclined to aid the work, any assistance which they may be inclined to contribute, would be gratefully received. Simple portable apparatus, diagrams of easy explanation, very elementary lectures, models, books on the sciences, and instructive biographies, calculated to encourage to persevering study and exertion, are the kind of gifts to which I allude in this appeal.

I am, &c.,
THOMAS HODGKIN, M.D.

35, Bedford-square, 26th 8mo., 1857.

PROPOSAL FOR THE FORMATION OF A MECHANICS' INSTITUTE AT JERUSALEM.

Having since my arrival in this city very constantly turned my attention to the examination of its state, and reflected very seriously on the means of benefiting it and its inhabitants of every class, I am so strongly impressed with the belief that something may be attempted with no great difficulty or expense, that I regard it as a duty to bring the subject under the notice of the friends of Jerusalem before I take my leave of it. I feel that it is not mere presumption on my part to make this suggestion, stranger as I am, because the idea is not a new one, and the proofs of past success in other places are so numerous as to sanction confidence.

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* The peculiarity of the apparatus to produce an electromotive force suitable in all respects for the requirements of an ocean telegraph, (patented June 1852,) consists in the application (to the working of Electric Telegraphs) of induced electricity produced from the closed or blind electro-magnet, whereby, from a given quantitative battery, a much greater magnetic influence can be produced than by a bar or open magnet, and consequently, greatly increased inductive effects are produced in the secondary coils. Further, by the application of an apparatus, (patented November 1850,) by which means the primary current is reversed, and made alternative, the inductive effects produced in the secondary coils are still further increased in intensity, and rendered more equable and distinct than by a mere make and break of the primary current. Thus it is, by these combinations, an electric force is produced of maximum intensity, combined with minimum of quantity, and in all respects that which is absolutely necessary and required for extended submarine circuits. As by these means of reversing the primary current, the inductive effects are not only more defined and equable in their action, but also alternative, it follows that, by their being alternative, their action on the conducting wire is to discharge or get rid of the retarding effects that accrue from the retention of a portion of the previous electrical action. From the minimum of quantity and the maximum of intensity that may, by extended arrangements, be put in motion by electro-magneto electricity, there is little to contend with in very long lengths of submarine conductors—which, beyond a thousand miles, as at present constructed, are practically nearly insurmountable with voltaic electricity; and as the electricity and the conductor may be made relative to each other, there is no reason to suppose but that, so long as continuity can be maintained, any required distance may be compassed by electricity so produced. The combination of electro-magnets or electro-magnetic induction coils for this purpose may be formed in squares or parallelograms—some with two joined at the ends by keepers, others with four, having the primary and secondary wires on all, and combined each into one circuit respectively, or with the primaries only on one pair of cores, and the secondaries on the other. The latter arrangement is supposed to produce the best effects.

I will endeavour as briefly as possible to set forth the kind of institution which I propose, and the means which I have contemplated for giving it existence.

The various changes and improvements which are absolutely necessary before Jerusalem can be brought into a satisfactory position, for all or any of its inhabitants are of such a character that they are not likely to be carried out or even properly attempted unless the principles on which they are founded are in some little degree understood.

Some of these principles, which are the most essential, admit of being explained in a very simple and popular yet very convincing manner. Even in this form they will at first be understood and appreciated by a few only. But if a few taste the pleasure of knowing them the disposition to inquire will be excited, and these, by their example, by their intercourse with others, and by the information which they will gradually diffuse, will not only bring others to join them in acquiring knowledge, but they will facilitate those operative and tangible improvements which cannot be made without being appreciated and applauded, even by those who have not taken the trouble to understand them.

A few examples will suffice to explain and illustrate my meaning.

We will suppose that a simple lecture is given on the mechanical powers. The properties of the lever having been made evident, even without the use of words, by a few ready experiments, the office of wheels will be easily explained, and a working model, which a child's toy may supply, will show how much is lost in Jerusalem and its neighbourhood by the want of wheels, and how great is the inconvenience of being confined to the unaided strength of men, donkeys, and camels. But wheels demand roads. The inclined plane is shown, and its application to roads is exhibited, as well as its misapplication in bad roads of excessive steepness, and covered with loose stones, which scotch the wheels, but in the wrong direction.

The advantages of wheeled carriages and roads having been shown, it will be a very allowable digression to point out some of the present great and pressing evils resulting from the want of both. Articles brought from a moderate distance are doubled in price by the cost of carriage. The producer sells less, and the consumer buys less than is required by the wants and interests of both. The carrier is also a sufferer, for he is employed as little as possible, and though his charge be high he is paid a small total amount, because it cannot answer his employers' purpose to pay more. City and country suffer, and the evil grows worse by continuance, instead of being more tolerable by use. Lime and timber and fuel are amongst the articles which furnish strong evidence of the truth of my statement.

A popular exposition of animal physiology would set forth the reasons which render cleanliness of persons, dwellings, and streets, no less essential to public health than they are to individual comfort when they have been really experienced. These explanations, followed up by the narration of some striking facts regarding dirty and unhealthy towns, would make public regulations for the cleansing of the streets very popular rather than the contrary.

A similar setting forth of the principles of vegetable economy would render intelligible the use of manure, which is now so much neglected. The husbandmen and the gardeners would then be as desirous to obtain the refuse of the town, as the citizens would be anxious to get rid of that which they now tolerate, if they do not absolutely regard it with indifference. On this subject abundant, interesting, and illustrative examples might be given. The filth of Edingburgh, now well applied to the previously barren tract in the neighbourhood, has raised the value from almost nothing to something like £20 per annum for every acre. The peasants of the north of Italy convey the ordure of the towns to the vine yards and olive yards of their steep hills, and obtain the large and valuable crops from both, which contribute to the wealth and prosperity of the country. In London and some other cities, a considerable revenue, applied to the public service, is derived from the dirt and refuse collected from the streets and houses.

With the force of this persuasion, the mass of pestiferous filth accumulated near the Jaffa-gate and in other places, to the great annoyance of all who approach it, would quickly be fetched away with avidity, to be placed on those bare or scantily covered rocks which, for want of it, produce none of those fruits which from their favourable position they ought, with its assistance, largely to yield, for the ample remuneration of the intelligent as well as industrious cultivator.*

The explanation of a few chemical facts and principles would greatly interest and amuse, and not only stimulate to study, but facilitate the comprehension of other lectures, and also suggest the modification and improvement of processes now in use in various departments of art.

One of the greatest difficulties which has suggested itself to me, and the first urged by nearly every one to whom I have explained my proposal, has been that of the language in which the lectures should be delivered.

The difficulty, on mature reflection, has very much diminished. In the first instance, it will be indispensable to have recourse to the kind aid of foreigners to deliver the lectures. They will, of course, in most cases, prefer the use of their own languages. In lecturing to those who differ from them in language, and who are, for the most part, ignorant of the subject to be taught, they will be especially careful to let their illustrations, whether diagrams, models or experiments, be such as may, as far as possible, speak to the eyes.

In the short time which I have already spent in Jerusalem, I have found that there are no inconsiderable number of persons who, besides their own, can speak one or more foreign languages, such as the Italian, German, Spanish, English, or French. In any of these languages many would understand a lecture well, and some imperfectly. The first would be really taught, the second more or less amused or interested. They would, many of them, seek further explanation from the lecturer himself, or from some of those who well understood him, and thus besides ~~the knowledge of a new subject~~, they would be stimulated to improved acquaintance with another language than their own. The most studious would follow up the lectures by reading on the subjects, and, probably, as in the English town, classes for students would be formed amongst themselves subsidiary to the lectures.

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* It is likely that the value of this manure may not be properly appreciated for some time to come, and the expense of its removal becoming a pecuniary burden, this necessary sanitary measure may be abandoned or imperfectly carried out. Capital will be acquired by the occupiers of land who engage in the work with the hope of profit, and the tillers of the land here being generally poor, I have thought that some of the convents rich in land, as well as in pecuniary resources, might be induced to make a beginning. The Greek convent offered the greatest probability in this respect, and I obtained an introduction to one of its superiors much interested in agriculture. I was agreeably surprised to find the subject already well understood, and that an offer had been made from the convent to do the work, provided certain facilities and guarantees were given. It would seem fair to all parties that at first starting the expense should be divided—that sooner or later this should rest with the utilizer of the manure, but that the privilege of having it should be secured to him for a definite period, as expense will be incurred in the means of transport. When this term of a sufficient number of years is expired, it might be desirable to offer the dirt and refuse of the town in sections and for fixed periods to the highest bidder, the contract to be set aside if the work be not properly performed. Seeing that the resources of the country, and, consequently, the comforts of the people, and the revenue of the Government also, are greatly restricted by the scantiness and poor quality of its productions, it might be well to give to those who are ready to apply the town manure to a useful purpose, the privilege of planting olive, palm, and other trees, which shall be exempt from tax. In fact, every tax of this kind seems likely to be productive of poverty and evil.

Again it has been asked, where are lecturers to be found? To which I reply that we must, as has often been the case in England, have recourse to the kind gratuitous help of friends, and this very circumstance will, I trust, in Jerusalem, be found, as elsewhere, to produce the happy effect of bringing together in harmony those whom differences of opinion on some points have kept apart to mutual injury and loss. No compromise of opinion would be incurred, whilst in the improvement of Jerusalem all would be benefited, from the Pasha to the Bedouin.

In order, as far as possible, to remove the idea of a political action, I would aim at having the governor of the city as the president, and some of the highest Turks vice-presidents.

Lest it should be thought that the idea having been started by an Englishman, some British object was contemplated, I have sought the aid of a continental consul rather than my own, and though I trust that my countrymen will aid the work, I would advise that special pains be taken to obtain the support and assistance of Italians, French, Germans, and Greeks, and, if possible, from the various convents maintained by these nations, and doubtless possessing men of leisure and ability also.

An admirable suggestion has been offered by the Austrian consul, that a school of design should be made an early and conspicuous part of the Institution, since it would not only essentially address the eyes, but its utility would be immediately apparent in the application to the commonest works, executed by the mechanics of the most numerous classes.

In a population like that of Jerusalem and the adjoining country, the true principles of economy, on the large as on the small scale, require to be understood and acted upon, and that science which Adam Smith was one of the first to set up in his "Wealth of Nations," might very simply be taught as now corrected, developed, and applied.

Proceedings of Institutions.

Chester.—The twenty-second annual report of the Mechanics' Institution presented to the annual meeting, speaks of the brightening prospects which are opening around it. In the first year of its existence it was enabled to purchase one of the public libraries of the city. The second year saw the establishment of the nucleus of what is now the Water Tower Museum, which has ever since been a source of profit to the Institution, and of instruction and amusement to the members and the public. Twelve years ago it removed from Goss-street to the more commodious premises at present occupied by it, where from that time till now, it has, in spite of a few checks arising from various causes, kept on a steadily advancing course. Last year, the building having changed hands, the rent was advanced from £30 to £52 10s. per annum; but a hope was held out by the then committee, that through the liberality of the members and the public, they might be enabled to purchase it before the month of June in the present year. That hope has been realized—the purchase is completed; and although the whole is not yet paid for, still the interest on borrowed money required for that purpose will have the effect of reducing the rent from £52 10s. to about £27 per annum. The Institution has also purchased, on very easy terms, the whole of the library and fixtures of the "City Library;" the Mechanics' Institution thus becoming the only public repository of literature in the city; the whole constituting a collection of about 16,000 vols. Considerable additions have been made to the library, and the number of volumes exchanged during the year is as follows:—Works on arts and sciences, 470; poetry and the drama, 202; tales, novels, &c., 3,219; essays and criticisms, 130; history and biography, 553; voyages and travels, 176; mental sciences and theology, 136; periodicals, 754; miscellaneous, 42; making a total of 5,682. The classes,—a very important department of the Institution, are, on the whole, satisfactory. The lectures, although few in number, have on the whole been pecuniarily profitable, as well as highly instructive. The only *paid* lecturer engaged by the Institution was B. Waterhouse Hawkins, Esq., who delivered a course of two lectures on "the Extinct Animals of the Antediluvian World," which excited great interest, and resulted in a nett profit to the Institution of about £20. The following gentlemen gave gratuitous lectures, and to them the committee desire to tender their thanks:—"Drawing Room Representations of Shakespere," by the Rev. R. Boyle; two lectures on "Nineveh," by the Rev. W. H. Boscawen; one on "Shakespere," by Lord Lyttelton; "On the Distinctions in Society worth having, and how to obtain them," by the Rev. R. Ainslie; "On Gas—its early and modern history, manufacture, and application to general purposes," by Mr. Samuel Edwards; "On the Occultation of Jupiter," by Mr. Edward Jones; and "On Honour, Etiquette and Fashion," by Mr. Mott, of Leicester. The number of members during the year is as follows:—Annual, 99; quarterly, 655; average per quarter, 259. The Water Tower Museum continues to be an object of great attraction to the public, and the profits derived from that source during the year amount to £21 9s. 8d. The presentations and loans of articles of vertu, antiquity and curiosity, are numerous, and the committee beg to return their thanks to those ladies and gentlemen who have so kindly contributed to this valuable collection.

PARLIAMENTARY REPORTS.

SESSIONAL PRINTED PAPERS.

Par. No.

Delivered on August 27th and 28th.

289. Court of Chancery (Ireland)—Return.
49 (3). Trade and Navigation—Accounts (31st July, 1857).
226. Maldon Election Petition—Minutes of Evidence.
218. Duchy of Lancaster (Bertolacci's Petition)—Report from Committee.
285. East India (Importations)—Return.
304. Australian Postal Service—Return.
200. Bill—Markets and Fairs (Ireland).

Delivered on August 22nd.

Public General Acts—Cap. 15, 16, 17, 18, 19, 20, 21, 22, 23, 24, 25, 26, 27, 28, 29, 30, 31, 32, 33, 34, and 35.

PATENT LAW AMENDMENT ACT.

APPLICATIONS FOR PATENTS AND PROTECTION ALLOWED.

[*From Gazette, August* 21.]

Dated 3rd August, 1857.

2104. John Elce and John Leech, Manchester—Improvements in self-acting temples for looms.

Dated 4th August, 1857.

2106. Richard Birch, and Robert Bradbury, Haughton, near Denton—Improvements in machinery and apparatus for cleaning and mixing hatters' furs.
2108. Alexander Prince, 4, Trafalgar-square—A substitute for varnish, turpentine, and oil in the manufacture or mixing of paints and pigments, to be employed for coating or covering wood, metal, glass, and other substances, to preserve them from atmospheric influences and fire. (A communication.)
2110. John Henry Johnson, 47, Lincoln's-inn fields—Improvements in sewing machines. (A communication.)
2112. William Colborne Cambridge, Bristol—Improvements in the construction and working of endless travelling railways.
2114. Alfred Vincent Newton, 66, Chancery-lane—Improvements in umbrellas and parasols. (A communication.)

Dated 5th August, 1857.

2115. John Littlewood and Albert Schlumberger, Church, near Accrington—Improvements in producing printed or dyed colours from murexide on woollen fabrics or yarns, or mixed fabrics or yarns of wool and cotton.

2117. Sebastien Botturi, Rue de la Roquette, 149, Paris—The making of movable chairs and seats of every kind and description, to be called "Botturi's movable chairs and seats."

2118. Thomas Lyne, Malmesbury—An improved field stile or gate.

2119. Thomas Field, Spring-place, Kentish-town—Effecting improvements in parasols and umbrellas.

Dated 6th August, 1857.

2120. Samuel Middleton and John Lowes, Southwark—Improved apparatus for the extinction of fire in buildings.

2122. Alexander Dalgety, 7, Joyson-street, Strangeways, Manchester—Improvements in rotary engines and pumps.

2123. Daniel Jones Crossley, Hebden-bridge, Yorkshire—Improvements in the treatment of certain textile fabrics called "pellones," and used for saddle covers, and in the machinery or apparatus for effecting the same.

2124. Ellis Rowland, Manchester—Certain improvements in steam-engines.

2125. William Gilmour, Dalbeth, Lanark, N.B.—Improvements in obtaining motive power.

2126. Thomas Lawley, Wolverhampton—Improvements in ornamenting articles made of tin plate and of other bright metals.

2127. John Parker, Ivy-house, Bradford, Yorkshire—Improvements in the means of supplying or feeding steam boilers with water, whereby a great saving of fuel is effected.

Dated 7th August, 1857.

2129. John Bradley, Radcliffe, Lancashire—Certain improvements in machinery or apparatus for engraving metallic cylinders or rollers employed for printing calico and other surfaces.

2131. Alfred Vincent Newton, 66, Chancery-lane—Improvements in mules for spinning. (A communication.)

Dated 8th August, 1857.

2133. William Irving Holdsworth, Shaw Lodge Mills, Halifax—Improvements in weaving woollen damasks. (A communication.)

2135. Isaac Oschinsky, 16, Old Broad-street—An improved soap, to which he gives the name of "rheumo arthritti soap."

2137. John Anderton, Joseph Foster Rushworth, and Joseph Benn, Queenshead, Yorkshire—Improvements in machinery for moulding, cutting, and carving wood and stone.

Dated 10th August, 1857.

2139. James Bertram, Edinburgh, and John Louis Jullion, Foots Cray, Kent—Improvements in the manufacture of paper.

2143. Amherst Hawker Renton, Buckingham-street, Adelphi—Improvements in apparatus for steering vessels. (A communication.)

Dated 11th August, 1857.

2145. George Chambers, Cheapside—Improvements in separating cinders from ashes and economizing fuel.

2149. William Edward Newton, 66, Chancery-lane—Improvements in pickers for looms. (A communication.)

[*From Gazette, August* 28.]

Dated 19th June, 1857.

1710. Stanislas Tranquille Modeste Sorel, 10, Rue de Lancry, Paris—New chemical compositions, producing either house paintings, cement, or plastic paste to be moulded.

Dated 4th July, 1857.

1870. John Smith, Bradford, Yorkshire—Improvements in flour-dressing machines.

Dated 7th August, 1857.

2128. Berthold Lowissohn, Fenchurch-street—An improvement in the manufacture of soap.

2130. John Robinson Scartliff, Wolverhampton—Certain improvements in mathematical instruments.

Dated 8th August, 1857.

2132. Thomas George Shaw, Dartmouth-row, Blackheath—Improvements in washing and wringing machines.

2134. John Langford and Joseph Wilder, Birmingham—Improvements in signals and alarums.

Dated 10th August, 1857.

2138. Thomas George Shaw, Dartmouth-row, Blackheath—Improvements in machinery for thrashing and separating wheat and other grain.

2140. John Roberts, jun., Whitechapel-road—Improving the combustion of fuel, and preventing the escape of fuliginous smoke from shafts and flues.

2142. Antonie Tremeschin, King-street, Snow-hill—Improvements in curling tongs.

2144. Peter Augustin Godefroy, 3, King's Mead-cottages, New North-road—An improved method of desulphurizing mineral-matrix, for the extraction of auriferous, argentiferous, and other metals contained therein.

Dated 11th August, 1857.

2146. Alexander Lang, Kinniel Iron Works, Linlithgow—Improved machinery for feeding steam boilers.

2148. William Lyell Groundwater, Bridge-street, Greenwich, and Henry Prince, the Grove, Great Guildford-street, Southwark—Improvements in pumps.

Dated 12th August, 1857.

2150. Thomas Hardcastle, Bradshaw, near Bolton-le-Moors—Improvements in machinery for washing textile fabrics.

2151. Robert Wagstaff, Mottram, Longendale, Cheshire—Certain improvements in machinery or apparatus for digging land.

2153. William James Cantelo, Southwark—Improvements in the preservation of vegetable matters.

2154. William Alexander Clarke, West Malvern—Improvements in the construction of and mode of applying hot air and vapour baths.

Dated 13th August, 1857.

2155. William Pratchitt and Samuel Horrocks, Bolton-le-Moors—Improvements in apparatus to regulate the pressure of fluids, and to compensate for the expansion of steam and hot water pipes.

2156. Henry Collingridge, 3, Saint Aldates-street, Oxford—Improvements in separating metallic substances for coffee, and in the apparatus employed for the purpose.

2157. Robert M'Adam, Baldoon, near Kirkinner, Wigton, N.B.—Improved apparatus to be employed in making cheese and in drawing off liquids.

2159. John Alleyne Bosworth, Humberstone, Leicester—Improvements in machinery for grinding and crushing clay and brick earth.

2160. George Tomlinson Bousfield, Loughborough-park, Brixton—Improvements in sewing needles. (A communication.)

2161. William Edward Newton, 66, Chancery-lane—Improved machinery for cutting files. (A communication.)

2162. James William Benson, Ludgate-hill—Improvements in the construction of bows or handles of watches, lockets, eye-glasses, and other articles requiring such appendages.

2163. Thomas Eade, Ipswich—An improved breech-loading fire arm and projectile to be used therewith.

Dated 14th August, 1857.

2164. John Parkinson, Victoria Works, Bury—Improvements in the construction of pressure and vacuum gauges.

2165. Paul Emile Laviron, Paris—Improvements in apparatus for curing smoky chimneys and for increasing the draft in them.

2166. John Tickle, Westbromwich, Staffordshire—Improvements in metallic pistons for steam and other cylinders.

2167. Charles Gumm, 'Change-alley, Cornhill—Improvements in the construction of boats. (A communication.)

2168. Frederick Lipscombe, Strand—Improvements in the mode of diverting the London sewage from the River Thames, and in discharging it into the sea.

2169. Samuel Draper, Lenton, near Nottingham—Improvements in the manufacture of handles and fastenings for doors of railway and other carriages.

Dated 15th August, 1857.

2171. William Smith, Manchester—Improvements in making soap.

2175. William Stettinius Clark, 133, High Holborn—Improvements in hay and hop presses, the same being applicable to compressing other substances of a similar nature. (A communication).

2176. John Coope Haddan, Cannon-row, Westminster—Improvements in the construction of railways and of the carriages to be used therewith or thereon.

2177. John Buckley and Thomas Wrigley, Carr Hill, Saddleworth—Improvements in self-acting mules or machines for spinning and doubling.

2178. Hubert Pirotte, Liege, Belgium—Improvements in the construction of lathes for boring and turning.

Dated 17th August, 1857.

2179. Archibald Smith, 69, Princes-street, Leicester-square—Improvements in machinery for, and in the method or methods of, making wire ropes.

2181. Richard Talbot, Blackburn, Lancashire, and Benjamin Croasdale, Witton, near Blackburn—Improvements in looms.

2183. Richard Hoe, 44, Leadenhall-street—Improvements in bullion boxes, and in boxes used for carrying other valuable commodities.

2185. William Edward Newton, 66, Chancery-lane—Improvements in the valve arrangement of steam and other engines. (A communication).

2187. Charles Reeves, Birmingham—Improvements in the manufacture of knives.

Dated 18th August, 1857.

2191. Charles Nightingale, Wardour-street, Soho—Improvements in, and applicable to, machines for tearing or reducing rags and other fabrics.

2193. William Young, Queen-street, City—Improvements in fire-places or stoves.

INVENTIONS WITH COMPLETE SPECIFICATION FILED.

2214. Amos Pierce Chamberlain, 19, Rue Royale, Paris—Improvements in machines for cutting corks and other substances.—20th August, 1857.

2227. Henry Hodges, New York—Improvements in the manufacture of gunpowder.—22nd August, 1857.

WEEKLY LIST OF PATENTS SEALED.

August 28th.

588. Charles Weightman Harrison.
599. Samuel Wright.
606. Thomas Rose, jun.
611. William Poupard.
612. Richd. Archibald Brooman.
613. David Patridge.
614. William Brown.

PATENTS ON WHICH THE STAMP DUTY OF £50 HAS BEEN PAID.

August 24th.

1888. John Gray, M.D.
1971. John Wesley Hackworth.

August 26th.

1892. John Seithen.

August 27th.

1927. James Parker.
2043. James Egleson Anderson Gwynne.

Journal of the Society of Arts.

FRIDAY, SEPTEMBER 11, 1857.

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METROPOLITAN DRAINAGE.

By John Leonard.

Notwithstanding that so much has been said and written on the subject of the drainage of the metropolitan district, there are several most important points which appear to me to have been entirely overlooked, some of which, if suffered to remain without a remedy, would render any scheme abortive. If, for a moment, we imagine the great work completed in the way commonly expected, namely, by collecting the matter in a vast system of sewers underneath the metropolis, and conveying it away by an open channel, either to Sea Reach or the German Ocean, a little consideration will soon convince us that such a plan would be but a miserable half-measure, and little or no improvement on existing arrangements. The immediate, if not sole object, of all improved methods of drainage is, avowedly, the health of the population, yet in the face of this it is proposed to retain the absurdity of the entire metropolis being undermined by an enormous extent of pestiferous sewers, which is only another name for one vast and interminable cesspool, with the additional evil of being spread over an immense area, instead of being confined to the smallest possible space. Any plan ought to be instantly condemned which does not provide an efficient remedy for so great and glaring an evil, and, if only for the credit of modern engineering, it is hoped that a veto will be put on all schemes involving the perpetuation of such anomalies, which, notwithstanding all the proposed and attempted remedies, appear to be inseparable from the sewer system of drainage.

Many and valid objections have, from time to time, been made against the practice of allowing the sewage to flow into the river, but, without for a moment advocating such a process for getting rid of it, I do not at present see how the formation of a new channel expressly for its conveyance can fully remedy the evil. In the one case the sewage is largely diluted with water, and the offensive smell in a great measure removed, and if conveyed in close conduits at all times of tide *into* the water, it would be almost entirely so. But this is a gain at the expense of the water, which is inevitably spoiled by the admixture. On the other hand, an open channel or small river, as it might be appropriately called, although passing through a comparatively uninhabited district, would be a perpetuated nuisance, its noisome smells, conveyed by the varying winds, pervading the country for miles on either side, and the shipping and crews of all nations exposed to a constant and unmitigated abomination.

Another, and by no means an unimportant defect in the sewer system, arises from there being so very little fall to carry off the drainage, which can only be met by the erection of powerful steam engines to raise the sewage to a sufficiently high level so as to give it the requisite impetus. In reference to this part of the plan it ought by no means to be lost sight of that the engines must be of sufficient power to deal, not only with the proper sewage, but also with the entire surface drainage or rain fall, and that, too, not the average, but the greatest and most sudden that under any circumstances might be expected, hence a much greater outlay for pumping power as well as other works would be required, than would be the case if the sewage *alone* were the matter to be dealt with. It is true that one way of surmounting the difficulty would be to provide overflows, by means of which the surplus, beyond a given quantity, might be discharged into the river, but this is such a half-and-half way of dealing with the case, that few would recommend or adopt it. Besides, if sewers could once be dispensed with, for strictly sewage purposes, they would soon become wholly unnecessary for surface drainage, as doubtless channels nearer the surface, and consequently more accessible, would then be constructed for that purpose.

Again, assuming the drainage of the metropolis to be completed, on the sewer or any other system, and the sewage wholly diverted from the Thames, in what way must that which proceeds from all the towns on either side of the river *above* London, be dealt with? Such places cannot convey their sewage to the sea, and it is equally obvious that that of London being once excluded from the river, they could not possibly be permitted to continue discharging theirs into it. It is clear, therefore, that in their case (which, be it observed, would apply to perhaps nine-tenths of the entire kingdom), they would have to devise some other means of dealing with the nuisance, and that such means, whatever they might be, would of necessity involve their keeping it entirely to themselves. Hence, if by far the greatest number of towns must of necessity adopt plans of drainage differing materially from that of the metropolis, is it not reasonable to inquire if there is not some plan which would be applicable as well to the metropolitan as the inland districts, and at the same time, entirely free from the defects which I have endeavoured to point out in the contemplated scheme of London drainage?

I am led, by the consideration of these circumstances, to the conclusion that although drainage by means of sewers would perhaps very naturally suggest itself as the best means of effecting the object originally, and doubtless two or three centuries ago nothing better could have been substituted, it by no means follows that it is so at the present time. It rather appears to me that in this, as in many other instances, a certain plan is adopted, because it is found to some extent already in existence; and hence, without reflecting what better could be done, we very naturally slip into the old groove, and slide along it as our predecessors have done before us. We, moreover, I think, overlook the circumstances under which sewers were in a great measure originally constructed, and the purposes for which they were intended. The modern introduction of water-closets has quite changed the conditions of town drainage, and that which was formerly the rule, namely, cesspools for sewage, and sewers for surface drainage, has now become the exception. Had it been otherwise, doubtless our forefathers, who prohibited coal from being used in the City on the ground of its being prejudicial to health, would have been equally averse to poisoning the air with sewage effluvia, and would have provided some means of preserving themselves from the unwholesome smells which now assail us on every side. The sewer system might perhaps be more tolerable if the means of preventing the exhalations arising from them were fully available, and could at all times be depended upon; but judging from what has so far been done or attempted by means of flushing, trapped gullies, air shafts, &c., there is every reason to conclude that they are each and all either inefficient, or have not been fully or properly tried; be that, however, as it may, it is clear that they require more or less machinery, constant attention, and extra care, and necessarily involve occasional, if not frequent, failure.

I assume, from the preceding remarks, that sewers of all kinds are objectionable, inasmuch as, however constructed or managed, they are detrimental to health, exceedingly disagreeable to the senses, and very imperfectly perform their functions; and that when extended over so vast an area as the entire metropolitan district, these disadvantages, notwithstanding all known means of prevention, would be multiplied to an indefinite extent, and ever exercise an injurious effect on the general health.

As there appears to be but little use for further argument in support of the views here expressed, I will, therefore, proceed to suggest a plan, which, in my opinion, would be less costly, would effect the object in view far more efficiently, and provide a remedy for all the defects which have been pointed out as inseparable from sewer drainage.

The general flatness and want of fall throughout the metropolitan district would, under any circumstances, render steam-pumping power indispensable. Instead, however, of mixing the sewage with the surface water, conveying it through sewers with just sufficient fall to give it a sluggish motion onward, and then lifting the combined mass from a considerable depth to a sufficiently high level to give it another start, I propose to use the steam-power to pump, or draw (if I may so express myself) the sewage only, through and along pipes, directly from the places where it is first formed, and discharge it by the same means immediately into tanks prepared for its reception and conversion into manure.

The plan here proposed would, I think, as compared with sewer drainage, possess the following advantages, namely, by placing the pumping machinery as it ought to be, in a low lying district, it would have the benefit of the natural fall of the ground; and in addition, the effect of atmospheric pressure, equivalent to a further fall of at least thirty feet. By separating the sewage from the surface and having to pump up only the former, a very much smaller pumping power, as well as works for the conversion of the sewage into manure, would be required, and the expense proportionately reduced. When once completed, the pipes, &c., for the collection of the sewage would require very little, if any, attention or expense for repairs; or if required the work would be above ground, and hence not unhealthy, accessible, and easily inspected, and consequently better and more economically done. There would be no offensive smells, or noxious effluvium thrown into the atmosphere, and all the cost and trouble attendant on air-shafts and trapped gullies, &c., would be saved. There would be no periodical cleansings required, nor any dirty and disagreeable employment necessary; and all the usual provision of machinery, water, &c., for flushing would be entirely dispensed with, and the cost and trouble saved; and being self-acting, no domestic attention would be required, nor would there be any available means of interfering with, or interrupting its regular action.

Without entering into unnecessary details of pumps, and the process of pumping, I may be permitted to explain that portion of the plan which I have described as self-acting, and therefore requiring no domestic attention. This is a vessel, with which I propose that every house, manufactory, &c., should be provided for the reception of all slops and sewage matter. It should be made of cast-iron, covered with an immovable grating, which should be perforated so as to prevent the access of other than fluid or semi-fluid matter, and provided with an inaccessible self-acting valve, which, by means of a float, would open by the flow of the sewage into the vessel, and close again as soon as the flow should cease. This vessel should be semi-globular in form, with the grating fastened by screws to its upper rim, so as to be removable if desirable; within the vessel, and under the grating, is the copper float, attached to and forming part of a small double beat valve, the lower face resting on the bottom of the vessel, which forms a seat for it, and the upper one on a seat supported by a spindle, which rests on the bottom of the box beneath the valve. This box is intended to retain anything which may be too heavy to drawn away by the action of the pump, and is provided with an opening in the front, closed by a bonnet, to allow of access to it for occasional clearing out. The upper seat of the valve is supported on the spindle, which again rests on the bottom of the box, so as to allow a clear and uninterrupted water-way to the lower opening, and to permit bits of thread, rags, &c., to pass without danger of accumulating, so as to partially close the passage. This receptacle would be placed in the area, or lowest part of the house, and a small pipe attached to the box beneath, would lead up from thence to the street main. It is by no means an unimportant feature in the plan that on its introduction all the usual machinery connected with water-closets might be entirely dispensed with, as it is evident that owing to the sewage being constantly discharged as fast as formed, no smell whatever could possibly arise from it, and a simple flap valve attached to the exit end of the soil pipe would be all that would be necessary, and that merely to prevent draughts.

I have purposely omitted all reference to the expense of carrying out the plan I propose; not because I am apprehensive it would exceed that of draining by means of sewers, but because I am of opinion that, in a work of so much importance, in a national and sanitary point of view, mere cost ought by no means to be made a primary consideration. The main question to be considered and decided upon should be, not what it will cost, but which is the best and most effectual way of doing it? The imperfections of the sewer scheme are manifest and important, and our proper course is to ascertain how they can best be obviated.

In carrying out the scheme of pumping away the sewage, I should be disposed to lay the main pipe along the river side at about low-water mark, providing that in passing dock entrances, and such-like depressions in the shore, it would not be necessary to have hollows or undulations in the pipes. Indeed, this should be most carefully guarded against, even at the increased expense of carrying the main inland to avoid such places. On reaching Limehouse I would leave the river, and conduct the main thenceforward along the Commercial and East India Dock roads, until it reached a large piece of garden ground called Bromley Marsh, situated on the western bank of the river Lea, near the north side of the East India import dock. Here I would place the grand depôt for the pumping machinery and the tanks, &c., for the conversion of the sewage into manure, from whence it would be conveyed to any part of the country, either by barges by the river, or by land by means of a branch line from the North London or Eastern Counties Railway.

The drying process, which, after the deodorisation and settlement had been effected, would be similar to that in use in the manufacture of pottery, would consist of numerous shallow tanks or ponds, underneath which would be a series of flues, leading from a fire placed at one end, by means of which the semi-fluid matter could soon be dried to the consistence of stiff clay. In this process no machinery of any kind is required, which renders it much more manageable and less liable to get out of order.

Objections would of course be made to the process of conversion being carried on so near town, but it must be borne in mind that whatever site might be chosen for the erection of the works, it would in time, by the mere increase of population, become a nuisance; besides, there exists no right by which one part of the community can rid itself of a nuisance by inflicting it upon another, so that we are driven to the alternative of dealing with our sewage as we would have others deal with theirs, namely, keeping it to ourselves and making the best use of it. The site pointed out is, moreover, the best for the northern part of London in other respects, inasmuch as it is sufficiently distant from other buildings as well as from London itself. It lies low, is convenient for both land and water carriage, and avoids crossing the river Lea.

If, then, the sewage, as well as the processes for its conversion into manure, are to be retained in our own neighbourhood, it is essential that every means should be used for so conducting the work as to remove all unpleasantness from it. Fortunately our experience justifies us in saying that this can be effected by the lime process without difficulty, and if more were needed, the complete removal of all deleterious gases might be insured by causing the vapour arising from the drying process to pass through the fires used for that purpose, and being then discharged into the atmosphere by means of high shafts, scarcely anything could remain which would offend the nicest sense. I may add, that the works being under the control of a central body, instead of individual influence, any regulations for conducting the processes with due care could be more easily enforced, and improvements without difficulty introduced whenever necessary.

Various and opposite opinions have frequently been expressed as to the possibility of deriving a profit from the conversion of the sewage into manure. To me this appears to be utterly beside the question, and scarcely deserving a moment's consideration in association with the important subject of town drainage. The sewage of almost every place of any importance has now become such a nuisance, that it *must* sooner or later be removed at almost *any cost*. In all directions around towns, especially manufacturing ones, every stream and rivulet is polluted with filth, and the surrounding atmosphere poisoned with the effluvium arising from it, and so it will remain, doubtless, until every place of any magnitude is by law compelled, not only to keep its drainage within its own district, but also to deprive it of its noxious properties, so as to be no annoyance to the neighbourhood. I am by no means indifferent to the importance of economy; I merely submit that in this particular instance it is, as a primary object, out of place. The general introduction of town drainage appears to me to be inevitable; if the products can be disposed of at a profit, well; if not, they must be given or thrown away. But this would be unnecessary, as doubtless the manure would be gladly fetched away, if it would not command a price.

I would here offer a suggestion with the view of submitting the plan I propose to a practical test. There is a small district in the eastern part of London, comparatively cut off from all others, namely, the Isle of Dogs. If, as I have before proposed, the main should be carried inland in some instances, in order to avoid the depressions in the river shore, caused by the increased depth of water required at the dock entrances, then this district would, from that cause, require a separate system of drainage to itself. This, of course, would not be absolutely indispensable, but inasmuch as it would be the best arrangement, it would offer a very good opportunity for giving the scheme a fair trial, on a small scale, and at a moderate expense. This entire district will probably in a few years be converted into docks, and surrounded by building yards, manufactories, and warehouses, so that any outlay for the purpose here proposed, would by no means be thrown away, but, on the contrary, might rather be expected to require additions before the lapse of many years.

It is, I think, quite possible to proceed in a much better way to effect the metropolitan drainage than has hitherto been attempted. Boards and Commissions have so far effected little or nothing, notwithstanding their having been in existence so many years; nor does there appear the slightest probability of their ever being of any use in the matter. Instead, therefore, of depending any longer on them, I would advertise for plans, estimates, and tenders, from a few of our best and ablest contractors, accompanied by tenders under guarantee, at which they would not only maintain the works, but carry them on for any number of years that might be agreed upon. From these we should quickly learn the best and most economical way of doing the work.

In conclusion, I would observe that in my remarks I have only had in view the north side of the Thames, but of course the reasons and arguments made use of would apply in precisely the same way to the south. The districts are much alike, the circumstances similar, and the marshes of East Greenwich offer the same facilities for a depôt as the Bromley marsh on the north side; and although the adoption of this site as a depôt would involve the crossing of the Ravensbourne, this river is very shallow compared with the dock entrances, and therefore would present no difficulty.

9, Mortimer-road, St. John's-wood.

SALE OF POISONS, &c.

The following is a copy of the Bill for restricting and regulating the sale of poisons, introduced into the House of Lords by Lord Granville, and amended by the select committee to whom it was referred. This Bill, from the pressure of other business, was not proceeded with, but it is understood that it will be re-introduced next Session:—

Whereas the existing restrictions on the sale of arsenic have been found to be insufficient, and the unrestricted sale of other poisons facilitates the commission of crime, and occasions frequent fatal accidents, be it enacted by the Queen's most excellent majesty, by and with the advice and consent of the lords spiritual and temporal, and Commons, in this present Parliament assembled, and by the authority of the same, as follows:—

I. Save where herein otherwise provided, this Act shall commence and take effect from and after the day of

II. The Act of the session holden in the fourteenth and fifteenth years of her Majesty, chapter thirteen, "to regulate the sale of arsenic," shall be repealed with respect to England.

III. In the construction of this Act the word "poison" shall mean any drug or substance mentioned or referred to in the schedule (A.) to this Act.

IV. No person shall sell any poison to any person who is unknown to the person selling the poison, unless the sale be made in the presence of a witness of full age who is known to the person selling the poison, and to whom the purchaser is known, and who signs his name, together with his place of abode, to such entries as are required by this Act, before the delivery of the poison to the purchaser, and no person shall sell poison to any person other than a person of full age, unless there be produced and delivered to the seller, before such sale, a written certificate, signed by a householder, with his name and residence, stating that he knows the person for whose use the poison is required, and that he believes it may be safely supplied to him, and all such certificates shall be carefully preserved by the seller in the order in which they are received.

V. Every person who sells any poison shall forthwith, and before the delivery of the same, enter or cause to be entered, in a fair and regular manner, in a book or books to be kept for such purpose, in the form set forth in the schedule (B.) to this Act or to the like effect, a statement of such sale, and the following particulars:—

1. The date of the sale and delivery of such poison.
2. The name, surname, and address of the person to whom the poison is delivered.
3. The name and quantity of the poison sold.
4. The purpose for which such poison is stated to be required.

Into all of which circumstances the person selling such poison is hereby required and authorised to inquire of the purchaser, before the delivery of the poison; and such entries shall in every case be signed by the person so making the same, and by the person to whom the poison is delivered, and (where the sale is required to be made in the presence of a witness) shall also be signed by the witness, who shall add his place of abode.

VI. No poison sold in a solid state, except opium, shall be wrapped in paper only, without a secure covering either of tinfoil or sheet gutta percha, and all poison sold in a solid state shall have the vessel, box, wrapper, or cover, as the case may be, containing such poison, distinctly labelled with the word "poison," in conspicuous capital letters, and with the name, surname, and addres of the person selling the poison; and when any poison is sold in a liquid state, the bottle containing such poison shall be of blue-coloured glass of a triangular shape, and shall be labelled in conspicuous capital letters "poison," and with the name, surname, and address of the person selling the poison, and shall have the word "poison" cast or moulded in raised letters in the glass on the side of the bottle.

VII. No person shall sell any colourless poison whatsoever in a solid state, unless the same be, before the sale thereof, mixed with indigo, in the proportion of one part by weight of powdered indigo, at the least, to thirty parts by weight of the poison, save where such poison is stated by the purchaser to be required for some lawful purpose for which such admixture would, according to the representation of such purchaser, render it unfit, and in that case such poison may be sold without such admixture.

VIII. No person shall sell any colourless poison, except chloroform, in a liquid state, unless the same be, before the sale thereof, mixed with such a quantity of a strong solution of archil, not being less than ten minims by measure to one fluid ounce of the poison, as will give the fluid a decided colour, save where the poison is stated by the purchaser to be required for some lawful purpose, for which such admixture would, according to the representation of such purchaser, render it unfit, in which case such poison may be sold without such admixture.

IX. After the day of no person, other than a legally qualified medical practitioner, shall sell any poison without a licence to vend drugs granted under this Act.

X. For the granting of licences and the examination of persons desirous of obtaining licences under this Act, six examiners shall be appointed from time to time, three of whom shall be appointed by her Majesty under her sign manual, and the College of Physicians of London, the Society of Apothecaries of London, and the Pharmaceutical Society of Great Britain, shall severally appoint one of the remaining examiners; and every examiner appointed by her Majesty shall hold office during her Majesty's pleasure, and every other examiner shall hold office for such term as the body by whom he is appointed shall think fit and direct.

XI. The examiners shall sit in London or elsewhere in England, as they may from time to time think fit, and such examiners, or any three of them, shall from time to time examine persons applying to them for the purpose of ascertaining their proficiency in the branches of knowledge requisite to enable them safely to vend drugs; and any person who shall pass the examination to the satisfaction of the examiners conducting the examination, or the majority of them, shall be entitled to a licence to vend drugs, which shall be signed by the examiners by whom he may have been examined, or by any two of them.

XII. Every person having carried on for one year or upwards before the passing of this Act the business of a chemist and druggist, or of preparing, dispensing, and vending drugs and medicines by retail, shall, upon satisfying the examiners, or any two of such examiners, of the fact of his having for the time aforesaid carried on such business, be entitled, without any examination, to such licence to vend drugs, but no such licence granted without examination shall be in force for more than five years after the passing of this Act.

XIII. There shall be paid to such persons as the examiners shall appoint to receive the same, upon the grant of each licence by such examiners (save where such licence is granted after examination), a fee of , and for admitting any person to be examined, save where such person has previously received a licence which will cease to be in force after the expiration of five years after the passing of this Act, the like fee of , and the monies received in respect of such fees shall be applied in the payment of such allowances to the examiners in respect to their attendances in the grant of licences and in examinations, and of the expenses incident to the duties to be performed under this Act, as the examiners, with the sanction of the Secretary of State, shall from time to time direct.

XIV. Provided always, that it shall be lawful for her Majesty, with the advice of her Privy Council, from time to time to reduce the fees payable as aforesaid to such respective amounts as to her Majesty, with such advice as aforesaid, may seem fit, and every order in council reducing the said fees shall be published in the *London Gazette.*

XV. If any poison be given or delivered by any retail dealer in drugs (whether gratuitously or in exchange for any other article or thing) to any other person, such gift or delivery shall for the purposes of this Act be deemed a sale, and all the provisions and penalties of this Act applicable to a sale of poison shall apply to such gift and delivery, and for the purposes of this Act the person giving or delivering the poison shall be deemed the seller, and the person to whom the same is given or delivered shall be deemed the purchaser.

XVI. The provisions herein-before contained shall not extend to the sale of any medicine required to be made up or compounded according to the prescription of a legally qualified medical practitioner, or made up or compounded by a legally qualified medical practitioner, or by a veterinary surgeon having a licence or diploma from the Royal College of Veterinary Surgeons, or to the sale of any patent medicine.

XVII. And whereas it is expedient that as well members of the medical profession as others should be subject to regulations in respect of the keeping of Poisons and the delivery of poisonous preparations intended for external use:

Every person who keeps for sale by retail any poison, and every apothecary, surgeon apothecary, or other member of the medical profession, and every officer of any hospital, infirmary, or dispensary, who has under his custody any poisons, shall keep all such poisons separated from all other drugs and medicines, and distinctly labelled with their names, and shall keep in bottles of blue-coloured glass all liquid poisons and all other poisons usually kept in bottles.

All liquid medicines intended for external use, and consisting of or containing any poison, shall be sold and delivered in bottles of blue-coloured glass, and of a triangular shape, and labelled in conspicuous capital letters "poison," or "for external use;" the word "poison" or the words "for external use" being also cast or moulded in raised letters in the glass on the side of the bottle.

XVIII. The examiners under this Act, or any two of them, or any person or persons appointed by writing under the hands of two or more of such examiners for this purpose, shall have full power from time to time at reasonable times in the daytime to enter and search any shop or place where any drugs or medicines, simple or compounded, are sold by retail, to ascertain that the provisions of this Act concerning the keeping of poisons separate from other drugs and the labelling of the same are duly observed.

XIX. If any person sell any poison, save as authorised by this Act;

Or deliver the same without having made and signed the entries hereby required on such sale, or without having obtained such signatures to such entries as are required by this Act, or without complying with all the provisions of this Act in relation to the sale of such poison;

Or if any person purchasing the poison give false information to the person selling the same in relation to the particulars which such last-mentioned person is hereby authorized to inquire into of such purchaser, or procure, by a false certificate or other false pretence, such poison, or procure by false pretences a certificate for the purchase of poison;

Or if any person sign his name as aforesaid as a witness to a sale of poison to a person unknown to the person so signing as a witness;

Or if any person sell or deliver any liquid intended for external use, and containing any poison, otherwise than in such a bottle of coloured glass as aforesaid, and labelled as aforesaid;

Every person so offending shall for every such offence, upon a summary conviction of the same before two Justices of the Peace, be liable to a penalty not exceeding pounds for the first offence, and to a penalty not exceeding pounds for the second or any subsequent offence;

And every person so convicted of such offence more than twice, shall for the third and for every subsequent offence, upon a summary conviction of the same before two Justices of the Peace, be liable to a penalty of

And if the person selling or delivering any poison, or any liquid intended for external use, and containing poison, without complying with all the provisions of this Act in relation to the sale or delivery thereof, be an apprentice or servant acting on behalf of his master, then the master, on whose behalf the sale or delivery is made, as well as such apprentice or servant, shall be liable to the penalty imposed by this Act in respect of the offence.

XX. This Act shall extend only to England.

SCHEDULES REFERRED TO.

SCHEDULE (A).

Arsenic and its compounds.
Corrosive sublimate and its solution.
The poisonous vegetable alkaloids and their salts.
Prussic acid.
Cyanides of potassium.
Essential oil of bitter almonds, and any mixture containing it.
Cantharides.
Aconite and its preparations.
Opium, crude or in tincture, extract or powder.
Chloroform.
Oxalic acid and salt of sorrel.
Nux vomica.
Tartarised antimony and its solution.
Coculus Indicus.

SCHEDULE (B).

Date of Sale and Delivery.	Name and Surname of Purchaser.	Purchaser's Place of Abode and Occupation.	Name and Quantity of Poison sold.	Purpose for which required.	Name of Person giving Certificate.
Saturday, Sept. 26, 1856, 10.30 A.M.	Henry Holmes.	27, Snows Fields, Bermondsey; Shoemaker	Arsenic ½lb., coloured blue with indigo	For destroying Rats and Mice.	James Paget, Incumbent of St. Olave's, Bermondsey.

(Signature of Purchaser.)
HENRY HOLMES.

(Signature of Witness.)
JOHN SIMS,
26, Tooley-street,
Southwark.

(Signature of Vendor.)
SAMUEL EDWARDS,
Licensed Druggist,
18, King-street,
Southwark. *

* Address unnecessary if placed on article sold.

SOUTH KENSINGTON MUSEUM.

During the week ending 5th September, 1857, the visitors have been as follows:—On Monday, Tuesday, and Saturday, free days 3,566; on Monday and Tuesday, free evenings 6,015. On the three students' days (admission to the public 6d.), 330; one students' evening, Wednesday, 100. Total, 10,011.

OCEAN TELEGRAPHS.

The following remarks, by Lieut. Brooke, of the United States Navy, will not be uninteresting at the present time, when the subject is occupying so much of the public attention:—

"There are some who doubt the possibility of laying a telegraph cable across the Atlantic. I think it may be easily shown, however, that the eventual accomplishment of the project is much within the limits of probability. It is true that we have but little experience in this kind of engineering; yet in kindred branches there have been many interesting facts developed bearing directly upon this subject. We know, for instance, that not unfrequently four or five miles of small twine, less than one-tenth of an inch in diameter, have been veered into and dragged by heavy weights to the bottom of the sea; and that in some instances these lines have been recovered from a depth of nearly four miles.

"Suppose that, without attaching weights, you were to pay this twine freely out, and to run on with the ship; you might go from New York to Ireland, and if the line were slack enough to meet the demands of diverse currents, it would be unbroken. This twine would require no regulating machinery, but it would scarcely sink to the bottom.

"Now, in some experiments in the Gulf Stream, under the direction of Lieut. Walsh, six miles of steel wire were veered out, and much of it was recovered before breaking. You might, then, but for its too rapid descent, span the ocean with a wire; it would reach the bottom quickly, but would require the most minute attention and various appliances to regulate its velocity and to guard against waste. So that what we require is, to combine, as it were, the strength of iron with the lightness of twine; to construct a cable that may be strewn upon the water, to find its way slowly to the bottom while the ship runs at her highest rate of speed. Thus the greatest resistance to the descent of the cable may be obtained, and the tendency to slide away diminished. This most favourable of all conditions is only limited by the probable strain arising from the action of unequal currents.

"Gutta percha, the insulating material, affords a ready means of diminishing the specific gravity of wire cable. It is true that, in adding gutta percha, the surface exposed to the action of these currents will be increased; but there is evidence of their absence at the depth of a thousand fathoms: this we learn by microscopic examination of specimens obtained from the bottom of the sea. But apart from this, there is a compensation afforded by the movement of the cable itself—it will sink in the direction of its inclination; in other words, it will run away from the ship in opposition to her course, and this retreating of the cable may be termed its "back set." It is evident that, while this action tends to waste the cable, it will more than supply the demand of the current. This back set, which, with a heavy cable, presents the most serious obstacle, with a lighter one becomes an element of success. It is the opinion of several eminent men that the simple copper wire, clothed with gutta percha, most nearly fulfils the required conditions. But there are certain contingencies, liability to abrasion, from the rolling of the ship and in veering; it would even be endangered by the heel of a boot; a hungry shark would cut it in an instant; therefore, it is necessary to protect the gutta percha.

"The cable of the Atlantic Telegraph Company is composed of seven copper conducting wires coated with gutta percha, forming a core which supports in spiral coil some seventeen twisted strands of iron wire, each composed of several smaller wires.

"It remains to be seen, in practice, whether these various materials have been most advantageously combined.

"Suppose that the copper and iron wires were straight and parallel; in that case, since the relative ductility of these metals is about as four to five in favour of the copper, the iron wires would practically bear the strain, relieving the copper, and this without regard to change of form in the core of gutta percha. But in the cable now in process of manufacture, the outer wires make two whole turns to the foot. It becomes, then, a serious question, whether by strain, or the pressure of five or six thousand pounds to the square inch, the core will be compressed or altered in form. The water penetrating between the iron wires will surround each part of the cable, and on them, individually, exert its powers of compression; if the gutta percha yields, the iron wires will become loose—will extend—and the strain will come on the straight copper, drawing it, and although it may yield twenty per cent. of its length without breaking, any such process involves risk.

"It is stated that india-rubber is less compressible than water; and it may be inferred that gutta percha resembles it in that respect as well as in some others. But this comparative incompressibility of india-rubber is only observed when that substance is entirely immersed; but parts of the cable will be above water, and as gutta percha is of nearly the same specific gravity as water, its longitudinal extension, granting it incompressible, will chiefly be restrained by adherence to the copper wires; the outer spiral wires will in some degree elongate with the gutta percha.

"In its perfect form, this cable possesses flexibility, lightness, and great strength; it might be lighter with advantage. To say that a cable will support six or seven miles of its length when suspended in still water, conveys but a very general notion of its adaptability; for a rope, of specific gravity nearly that of water, would support many more miles of its length when so suspended. We must take into consideration the fact, that the cable is to a certain extent to be dragged laterally through the water, the resistance from this source will exhibit itself in the sliding astern, or back-set, before alluded to.

"It is this tendency of the cable to run in the direction of inclination, which will render the operation of laying it difficult. Perhaps it will be necessary to arrange the regulating machinery so as to indicate constantly the strain upon the cable, and then to veer no more than safety demands.

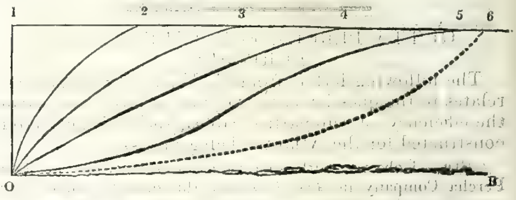
"It has been observed in *deep-sea sounding*, that the lines have a tendency to twist, probably in part due to the spiral character of their surface: it is usual, therefore, to attach swivels to them: the conducting wire does not admit of such an appliance. The smooth and unbroken spirals of the wire cable affording an easy passage to the water, it is to be anticipated that, as mile after mile of this cable goes down it will twist,—the turns will follow the ship and accumulate. But this prejudicial result may be modified by coiling the cable on board with reference to the resulting turns; and this application, which does not appear to have been recognised, makes useful disposition of these coil turns, rendering it unnecessary to complicate the arrangement of the cable on board by attempts to avoid or destroy them.

"The character of the curve assumed by the cable on its way to the bottom, will depend upon the velocity of its descent and the speed of the ship.

"If the cable, when extended horizontally upon the water, sinks faster than the ship runs, the convexity of its curve will be towards the bottom; the upper portion, nearly vertical, will descend more directly, and therefore more rapidly, towards the bottom; the lower portion will, consequently, be deposited in waves upon the bottom.

"But let us suppose that we have a cable which, when laid horizontally upon the water, will descend less rapidly than the ship advances.

"That we suspend this cable vertically from the vessel, at position 1, (see diagram,) its lower portion fixed on the bottom at 0; and that, then checking the cable, to prevent waste, the ship moves off at perhaps the rate of ten miles an hour.



"It is obvious that, as her dragging force is applied at right angles to the vertically suspended cable, the resistance of the water will cause it to assume a curve, (0.2,) its concavity towards the bottom. Now, as the vessel runs on from position 2 to 3 and 4, constantly checking the cable to prevent its running right down, the angle will become less and less, until the dragging force of the ship will be exerted nearly in the line of the cable itself, (0.4.) Then the gravity of the cable coming into play, carries it by this line, so that its convexity is towards the bottom, (0.5.) But the upper portion of the cable, which is being continually paid out from the ship, sinking with a lower velocity than the ship's rate, will still present its concavity towards the bottom, (0.5.) There will be a wave in the cable, and this wave will exist, whether we start as supposed, with a cable suspended vertically, or simply inclined, so long as it is checked on board the ship. And this checking cannot be dispensed with, except in the case of a cable much lighter than that of the Atlantic Company.

"This wave would, under certain conditions, cause the exhibition of singular variations in intensity of the strain upon the cable.

"If, for instance, the speed of the ship be reduced, more or less suddenly, to less than the sinking velocity of the cable, the wave will travel towards the ship, and the strain will be reduced in an extraordinary degree; but, a moment after, the cable, assuming the catenary (0.6), will exert a tremendous power. It would then be necessary to increase the speed of the vessel, without attempting to arrest the cable, until a considerable portion had been laid more horizontally upon the water, and the wave thus re-established. When we consider the great velocity of such a running out, we may fear fatal accidents as well as waste. And as we are impressed with the importance of attaching an indicator of intensity of strain to the regulating machinery, this may be accomplished by the employment of elliptical springs, so applied as to receive from the axle of the drum, or drums, the strain of the cable.

"Two such springs, furnished with graduated scales of compression, and applied, one to each end of the axle or axles, would, if the cable were limited to an intermediate space on the drum between them, show, by the sum of their indications, the strain of the cable, excepting that small portion applied in opposition to prevent the cable from *rendering* around the drums.

"As, in using drums, the protecting wire sometimes cuts through the gutta percha, it would perhaps be proper to score the drums in such a manner, that along the line of bearing the convex surface of the cable, lying in a close-fitting groove, would be generally supported; the power to cut would not then be concentrated in any single wire, but would be divided among them all.

"It seems preferable, in constructing a telegraph cable, to arrange the strengthening and protecting wires straight, and nearly parallel to the copper conducting wires, the latter slightly sinuous; and to cover the whole with an external coating of gutta percha, or other similar material, which would bind them together, and prevent their cutting the insulating core, which, as before remarked, sometimes happens with heavy cables.

"The present cable may not be successfully laid, but the eventual accomplishment of this great enterprise can scarcely be doubted."

GUTTA PERCHA FOR TELEGRAPHIC PURPOSES.

The following letter, from Sir W. B. O'Shaughnessy, relates to the question as to the effect of heat in impairing the efficiency of submarine cables, such as that lately constructed for the Atlantic Telegraph:—

"SIR,—I observe with surprise a statement from the Gutta Percha Company in *The Times* of this morning, that 'large quantities of gutta percha covered telegraph wire have been shipped to various Indian ports, and never, to our knowledge, has the slightest damage occurred.'

"I regret much to be constrained to adduce facts at variance with this statement.

"In 1853 the East India Company sent out to India, in sailing vessels, 700 miles of gutta percha covered wire, made by the company who address you, and packed by them in solid deal cases. On opening these cases in India, some weeks after arrival in the cold season, and without any exposure in the interval, it was found that the copper wire had in many places been forced through the gutta percha, which bore evident marks of softening by heat.

"We further found that a still more serious change had taken place partially, and was in rapid progress, by which the gutta percha became brittle, broke off from the wire whenever bent, and lost all its insulating power. This change had occurred within the unopened cases. To save as much as possible of the wire we coated about 200 miles with tarred yarn, and this arrested the change for a time. Still, eventually we had to condemn as useless about 500 miles of the wire.

"These facts have been reported officially to the Government of India and to the East India Company, and have been communicated by myself personally to Mr. Statham, the respected manager of the Gutta Percha Company's works. His illness and absence from London have, doubtless, been the cause of the Gutta Percha Company advancing, without full knowledge of the circumstances, the statement which appeared this morning. I am quite certain that they would not wilfully mislead the public on a matter of fact, whether trivial or important.

"The change in the gutta percha from the plastic to the brittle state is the effect of oxidation. This is proved by an elaborate series of analyses made at my request, by Professor Hoffman, of the Royal College of Chemistry, on samples of the gutta percha which had been altered in India.

"Gutta percha in its natural state contains—

Carbon	88·10
Hydrogen	12·40

"When altered by prolonged heat and keeping (this in cases not even once opened), two substances are formed, containing—

	No. 1.	No. 2.
Carbon	6·79 ...	67·70
Hydrogen	9·29 ...	10·09
Oxygen	27·92 ...	22·20

"These substances are totally useless as insulators. Wire surrounded by gutta percha thus altered must be considered, electrically, as so much uncoated metal.

"The facts now published give a warning which should not be neglected. If ignored, or lightly valued, the result will be great loss of capital and infinite disappointment to the community. I have done my duty, without bias or prejudice, in making this communication to all the parties concerned, although I am well aware that I might better consult my own comfort by remaining altogether silent.

"I wish it, however, to be clearly understood that I consider it quite practicable to send out the Atlantic cable, in suitable vessels, and with special appliances, without much risk from the causes of injury above described. My object is at present to warn those concerned not to send it out in the *Agamemnon*, or in ignorance of the facts described, and neglecting the precautions these facts suggest. Further, I see no difficulty in manufacturing a cable in which the tendency to oxidation and spontaneous heating, and the influence of heat from external causes, may both be effectually counteracted.

"I am, Sir, your obedient servant,
"W. B. O'SHAUGHNESSY,
"Chief Superintendent of Telegraphs in India.

"265, Gresham-house, Broad-street, Sept. 5."

CULTIVATION OF TRUFFLES.

M. Martin Ravel, of Montagnac, near Riez (Basses Alpes), the author of a pamphlet on this subject, of which an abstract appeared in a recent number of the *Journal*,* has just issued a circular to the effect, that he is prepared to supply the acorns of the truffle oak, at a moderate price, to those desirous of attempting to carry his method into practice.

The only kinds of soil suitable for this purpose are those of a calcareous or sandy nature, where the acorns are to be sown in the manner described by M. Ravel, and at the end of five years he considers that the oaks will be ready for the application of the larvæ of the "truffigène" fly, which he will then be ready to supply to purchasers of the acorns.

Orders must be sent to him not later than the month of October, in order that they may be executed immediately after the fall of the acorns, which should be sown as soon as they are received.

TURBINES.

The following is extracted from the *Scientific American*:—

"In 1846, Mr. Boyden, known as a very successful designer of Fourneyron turbines, entered into a contract with the Atlantic Cotton Mills at Lawrence, Mass., by which he undertook to convey to them his patent rights for important improvements in turbines for a sufficient number and size to use a specified amount of water, and to furnish designs and superintend the construction of the same. The corporation was to pay the expense of measuring the water used by, and the power derived from, the turbines, and if the power obtained was seventy-six per cent. of the power of the water expended, two thousand dollars was to be paid, and for every one per cent. above seventy-six, a further sum of three hundred and fifty dollars. Misunderstandings arose between Mr. Boyden and the officers of the corporation, and it was not until the summer of 1851 that one of the turbines was tested. The apparatus for testing consisted of a friction pulley and brake, constituting a Prony Dynamometer for measuring the power furnished by the turbine, and of a weir to gauge the quantity of water expended. The principal difficulty lay, in computing the flow over the weir, or, in other words, in measuring the quantity of water used. In the absence of positive proof, the parties were not able to agree upon a formula for computing this, and, of course, could not agree as to the per centage of useful effect furnished by the turbine on which depended Mr. Boyden's compensation. The contract provided that each of the turbines should be tested, but the Atlantic Cotton Mills found that to test more than one would subject them to great inconvenience, if not loss, and declined testing more than one. Mr. Boyden, however, insisted on his rights under the contract. The natural result of this state of things was a suit at law, brought by Boyden against the corporation, in the Supreme Court of Massachusetts. The case came on for trial in Boston, in January, 1856, but very little progress had been made, before the judge came to the conclusion, which he stated emphatically, that a board of competent referees would be a more suitable tribunal than a judge and jury. A reference was accordingly agreed to by the parties, the referees being Joel Parker, Professor of Law in Cambridge University; Benjamin Peirce, Professor of Astronomy and Mathematics in the same institution, and James B. Francis, the experienced hydraulic engineer, of Lowell. Eminent counsel were employed by both parties, and a most thorough investigation was had before the referees. It was claimed for Boyden that the turbine tested was 96 per cent.; this was attempted to be proved by the experiments, and also by a prodigious mass of calculations based upon very profound mathematical principles, by which, from the form, dimensions, and motion of the turbine, it was attempted to ascertain exactly the quantity of water discharged. These calculations were made by Mr. Boyden and his assistants, at a cost to him of over 5,000 dollars, which it was claimed should be reimbursed to him by the corporation. His whole claim was about eighteen thousand dollars, besides damages for breach of contract.

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* See page 538.

"On the part of the company it was contended that the per centage did not exceed 88 1-2 per cent., that being the result obtained by their engineer, who used the formula most suitable according to his views, for computing the flow over the weir; they objected, also, on several grounds, to paying the 5,000 dollars for the calculations, and also to paying damages for breach of contract.

"The referees awarded Boyden about 16,000 dollars, and costs of court and reference, but made no award as to the per centage furnished by the turbine. The actual economy of the wheel—undoubtedly *one* of the best, and probably the very best, adapted to its work of any ever constructed—will therefore always remain an open question, the maker claiming 96 and the user acknowledging 88 1-2 per cent."

PRODUCTIONS OF JAPAN.

The *Moniteur* states that "the Expedition under Commodore Perry, in the China and Japan Seas, has brought back information throwing a new light on these countries. There is now a treaty of commerce between Japan and the United States, and it is therefore interesting to know the principal productions of the former of the two countries.

"The mineral riches of Japan may be summed up as follows:—Gold, silver, copper, mercury, lead, tin, iron, coal, sulphur in a native state, and precious stones. Gold is found in many parts of the empire, and in large quantities, for in the space of sixty years Holland alone has received from that country gold to the value of from 625 to 1,250 millions. Mines of silver are quite as numerous as those of gold. The Portuguese, when they had the monopoly of Japanese commerce, exported that metal in one year to the value of 15 million francs. Copper abounds in the Japanese Islands; the natives purify it, and cast it into cylinders about a foot long and one inch in diameter; but the inferior qualities they simply cast into round-shaped pigs or blocks. It is said that mercury is abundant in Japan, but up to the present time it does not appear to have been exported. The same is the case with lead. Tin, which has been found in this country in small quantities, is so beautifully white as to resemble silver; but as the Japanese attach but little value to this metal, and make no point of searching for it, they are ignorant how far it is abundant or not.

"Iron is found in three of the provinces of Japan, and it probably exists in the others. The Japanese understand the treatment of the ore, and the iron obtained is of superior quality. They make a cast steel from it, the temper of which is not surpassed. The coal of Japan as an article of export, is capable of becoming a larger source of profit than any of the minerals before mentioned. In such a volcanic country as this it would be expected that native sulphur would be found in abundance. In some places it is found in beds of great thickness and breadth, and may be dug up as easily as sand. The Japanese Government derive a considerable revenue from this mineral. Diamonds have hitherto not been found, but agates, cornelians, and jasper stones of great beauty are abundant. As, however, the Japanese are not versed in the working of stones, there are no precise accounts of the resources of the empire in this direction.

"Pearl fishing is carried on on nearly all the coasts, and the pearls are mostly large, and of fine quality. The Chinese have taught the Japanese the value of their pearls by offering high prices for those of the finest water. Among the articles of export, mother of pearl, coral, and ambergris must not be forgotten."

SOUTH AFRICAN FIBRES.

Under this designation a number of useful and valuable fibres have been lately introduced into England from Cape Colony. They are the product of various tracts of country lying adjacent to Cape Town, Algoa Bay, Graham's Town, and other South African ports. Of these fibres the principal is that which is known to botanists and scientific travellers as *Juncus serratus*, but locally as the Palmet. The products of this tree and other local plants are especially adapted for textile manufactures, cordage, brushes, paper, stuffing, &c., &c.

Sir Wm. Hooker states that although this Juncus has been long known to botanists, yet its properties have not hitherto been noticed.

The Juncus tree is found in great abundance over the whole, or nearly the whole, of the South African peninsula, and the products of this tree alone are adapted for all the purposes above specified.

To secure~~, as far as possible, the~~ advantages to be derived from a commercial operation, a patent has been obtained by the discoverers, embracing and specifying the various trees and plants, and claiming specific uses for them; such, for example, as those above mentioned, and many others. The great and increasing demand for fibrous substances, for manufacturing purposes, in this country, renders the question of a large and steady supply one of the most important to the community, and presents to the merchant an ample field for enterprise. In this instance the uses are numerous. It is stated that the supply is all but inexhaustible—the means of obtaining it as to roads, labour, and transit, easy. This country is calculated to have paid to Russia during the present century more than £120,000,000 sterling for flax and hemp alone, and yet the demand for these and kindred substances increases, whilst jute, an admitted inferior staple, has for some years been imported from India to the extent of about £500,000 sterling per annum.

The occupation of a large number of the black population in field pursuits, for which they are specially adapted, is a question of colonial policy of the highest importance, as tending to increase the security of our possessions, and render the government of our colonies more satisfactory. Much interest has been taken in this question by the colonial authorities.

Specimens of these fibres may be inspected by the members and others interested in the question, at No. 6, Great Winchester-street, City, where Mr. R. Smith, the agent for Messrs. Wicks and Co., the introducers of these products, will give any further information which may be desired.

GAS LIGHTING IN CALCUTTA.

The Oriental Gas Company have received a letter from their managing director, from which the following is an extract, describing the first introduction of gas into Calcutta, which took place on the 6th of July last:—

"Calcutta, July 20.

"I have much pleasure in informing you that Calcutta is at last lighted with gas. It is about four years since the project was started in London. The delays and tedious correspondence we have had with the authorities, and the distance we have had to bring every article required in our works, with the losses sustained at the commencement by shipwreck, will show our shareholders the difficulties which have beset us.

"On Monday, the 6th inst., we lighted all the public lamps from Bow Bazaar, along Cassitollah, Chowringhee-road to the corner of Harrington-street, in all 55 (all lamp-posts). The success was complete, not one *contretemps* of any kind, and we have had them lighted steadily every night since, and they now are lighted as regularly and with as little fuss as if Calcutta had had gas for 20 years, barring ~~always the wonderment~~ and excitement of the natives. For the first week, the crowds which paraded the streets were immense, and their conjectures as to the cause of the light were amusing. Even now, crowds assemble every evening at each end, and run along the line with the lamplighter, setting up a shout of astonishment as he applies his lantern to the burner. The commissioners are highly pleased, as are also Lord Canning and Mr. Halliday.

"My own house, Prosono Coomar's house, Bodry's hotel, and F. W. Browne's are already lighted, and my servants are perfectly *au fait* at the gas lighting. Prosono had about 10,000 people in his house for the first two or three nights, gazing at the brilliancy of his lights with astonishment.

"We are getting mains laid, and fixing up the lamp-posts and brackets as fast as we can. We are to go on along the Chitpore-road as far as the lamp-posts will admit, and we are laying mains and fixing brackets along Radha Bazaar, China Bazaar, &c."

Home Correspondence.

CHINESE POISON.

SIR,—In your *Journal* of Sept. 4th, on "Chinese Poison," the following paragraph occurs :—"For suicide, after opium, the most common agent is the sediment of brine, which is highly corrosive." Can any of your correspondents give information on this passage? Does it mean the residue of sea salts, and which may contain bromides, &c., and so far answer the character of corrosive? and if so, is it used for other than poisonous purposes, and how can it be so commonly obtained? Or does the residue of brine mean that residue left after being employed for the preservation of meat, and when in addition to mixtures of salts there may be poisonous and putrescent matters of animal origin?

It would be of some interest if those conversant with Chinese practices would state the substances employed, and the mode of procedure, to preserve flesh meats. In this country it is well known that sea salt, nitrate of potassa, and other substances, are used to form the "brine" intended for preparing salted meat.

I am, &c.,
P. I. T.

VENTILATION BY THE STEAM JET.

SIR,—Some further information seems to be required than that afforded in your notice of this mode of ventilating coal-~~mines, before the claim~~ for novelty can be sustained. It is only a year or two since that experiment was carried out on a very large scale, with perfect success, by Mr. Gurney, but the enormous expenditure of steam required proved a bar to its general adoption. It was not a novelty even then, for all locomotive furnaces are urged by the steam jet.

To go further back still, about the year 1798, the late Mr. William Nicholson, of the *Philosophic Journal*, was in the habit of explaining and illustrating the steam jet and air blast, in his lectures at his house in Soho-square, and that either for exhausting or blowing purposes; and it has always been well-known that when the bellows nozzle and tuyere are properly constructed, a much greater effect is produced when the nozzle and tuyere do not fit tight.

A similar phenomenon also takes place, but in a more remarkable manner, in the case of liquids, as shown by Venturi's experiments on the contraction of the vein. A horizontal jet of water may be made to raise additional water from a lower reservoir through a vertical suction-pipe, if not more than 32 feet long. When the water in the lower reservoir is coloured, the experiment is rendered more striking.

Coal-mines are rendered uninhabitable principally by two gases—carbonic acid and carburetted or sulphuretted hydrogen. All that is necessary to get rid of the latter would be to sink a shaft down to the highest level of the workings, when the hydrogen, from its small specific gravity, would rush of its own accord out of the mine into the atmosphere.

Carbonic acid, however, being much heavier than atmospheric air, artificial ventilation must eventually be resorted to. The first expedient adopted, to enable the miner to continue at his work below, when the air of the mine is too foul for respiration, is to blow fresh air down to him; but, unfortunately, if ten, twenty, or a hundred times the quantity of fresh air he requires be blown down to him, still the deadly gas in his vicinity remains obstinately immoveable.

The modern practice is, to exhaust the foul air from the extreme end of the workings, by means of air-pumps or furnaces, when fresh air immediately supplies its place, and the mine is instantly put into a healthy condition.

A great variety of exhausting machines have been invented. I believe Taylor's is the best and most economical, though the Messrs. Gwynne's Centrifugal Exhauster may, in many cases, be more convenient and effective. But as the steam jet is so simple, and so perfectly answers the purpose, its only defect being great waste of steam, would it not be as well to make trial of the air jet, which would have precisely the same effect, and would be urged by the common steam-engine, by means of which the steam would be used with the usual economy.

In regard to the ventilation of coal-mines by means of furnaces, a great error is always committed by coal-owners, in placing the furnace half-way down the shaft, instead of having the furnace on the surface, and building a high and large brick chimney for draught. The action would be far more powerful, and absolutely free from danger, which the present practice is not.

I am, &c.,
HENRY W. REVELEY.

Proceedings of Institutions.

CARLISLE.—The sixth annual general meeting of the members of the Church of England Religious and General Literary Association, was held in the Reading room in the Athenæum, on Monday evening, the 17th August. The gathering was above an average one. Amongst those present were—Hubert Rawson, Esq., of the Villa, Stanwix, (in the chair); the Worshipful Chancellor Burton, Rev. Precentor Livingston, Rev. William Bell and Rev. J. Godding, (High School), Rev. Minor Canon Tireman, Rev. E. C. Wrenford, Mr. Redin, Mr. Perring, Mr. Charters, Mr. Blamire, Mr. Harrington, Mr. R. S. Bell, Mr. F. Dickenson, Mr. J. B. Mullen, Mr. Robinson, Mr. Holliday, Mr. Lloyd, Mr. Hogarth, Mr. Barnes, (secretary), Mr. Harris, Mr. Bulman, &c., &c. The Chairman, in opening the proceedings, said he hoped that the bishop would have favoured them by presiding that evening, but a note had been received from his lordship stating his inability to attend, owing to an engagement, and he (the Chairman), therefore, had consented to take the chair for that reason, and also because he believed he was one of the oldest members present, having been one of the originators of the institution. Some of them would recollect being present when the late Dean, the present Bishop of London, opened the Society in the Fawcett Schools. The Bishop of London had taken a very great interest in the Society; and certainly the interest which his Lordship had evinced in its success, and the efforts that had been made, led them to expect that a much greater number of persons would have been brought into the institution than had been. But though they had not proved so successful as they could wish, he (the Chairman) was not discouraged. The object of the institution was to draw the members of the Church of England closer together, to cultivate a better understanding among them, and to promote a true Christian feeling, thus showing that they were members of that church, not in name merely, but in reality. There were many similar institutions in Carlisle, but there was plenty of room for theirs, and he considered that as members of the Church of England, they should have a society of their own. The secretary was then called upon to read the Report, which expresses the regret of the council that the financial state of the institution is not so flourishing as could be desired. Owing to the debt with which the institution began the present financial year—a debt contracted by the expenses of lecturers from a distance—it was not thought advisable to encounter a similar risk in having a course for the past season. But in consequence of an arrangement with the Wigton Mechanics' Institute, the services of the Rev. J. B. Owen, of London, were fortunately secured; the travelling expenses having been divided between the two institutions, and the deficiency kindly supplied by the treasurer and Mr. Redin. The members had also the advantage of a lecture from the Rev. G. R. Moncrieff, the Rev. Jos. MacCartie, and the Rev. W. M. Schnibben. An effort was made, with partial success, to form classes for instruction, and the cordial thanks of the members are tendered to the following gentlemen for their kind services:—Rev. Wm. Bell, Bible Class; Rev. John Godding, Grammar; Mr. Wales, Phonetic; Mr. Rotheram, Arithmetic. In accordance with the title and intention of the institution, an endeavour was made to bring the religious element more into operation; and with this view it was thought desirable that the members should know something of the missionary labours of our Church in the colonies and heathen lands. Two lectures have been delivered on this subject, and it is to be hoped that they may soon be resumed. A weekly Bible Class was also formed, which is only suspended during the summer months. The Chancellor moved the adoption of the report, and took occasion to remark that they had had several lectures, and very excellent lectures too, but he thought they were not such as they should have. They had had a lecture on Indian missions, then one on Oliver Cromwell, then another on missions, followed by one on Queen Anne. That appeared to be very absurd. The lectures should be given on some subject from which instruction could be gained, rather than the desultory lectures which they had had. The object of lectures should not be altogether amusement, but the improvement of the mind. Mr. Joseph Barnes seconded the motion. Various resolutions were then proposed, and the meeting was addressed by Mr. Redin, Rev. Precentor Livingston, Mr. Perring, Mr. R. S. Bell, the Rev. W. Bell, the Rev. E. C. Wrenford, the Rev. J. Godding, and other gentlemen. The election of the council then took place, and the meeting separated after passing the usual votes of thanks.

WEDNESBURY.—The report of the Wednesbury Mechanics' Institution presented to the last annual meeting, states that the progress of the Institution has been marked during the past year, by greater manifestations of interest on the part of the members, than has frequently been the case. Two courses of lectures have been delivered, which have been well attended, and have more than cleared their expenses. The circulation of the books in the library has been considerably greater than last year. The number of volumes and periodicals taken out amount to 1,998. Last year it was 1,644. This circulation is more than could have been reasonably expected, considering the very limited number of new works that have been added. There has been a proposition for a Union of the Institutions in the district, for the purpose of exchanging privileges with each other. A resolution was passed by the council, in August last, "that members of any of the Institutions who have so mutually agreed, be admitted to all the privileges of the others, except that none may take out books from any library but that in connexion with his own Institution."

PATENT LAW AMENDMENT ACT.

APPLICATIONS FOR PATENTS AND PROTECTION ALLOWED.

[*From Gazette, September 4.*]

GRANT OF PROVISIONAL PROTECTION FOR SIX MONTHS.

August 15th.

2172. James Joseph Cardin, 9, Orange-street, Red Lion-square—Improvements in brakes for omnibuses.

WEEKLY LIST OF PATENTS SEALED.

September 3rd.

619. John Banks.
620. William Leuchars.
622. Edward Lindner.
627. William Taylor.
638. James Stephens.
645. Hugh Greaves.
650. Thomas Jefferson Thompson.
652. William Edward Newton.
653. James Kinder Cheetham and Thomas Southworth.
655. Richard Atkinson Coward.
661. William Petrie.
666. George Hawksley.
672. Rd. Archibald Brooman.
686. Carl Heinrich Julius Wilhem Maximilian Liebmann.
689. Alfred Vincent Newton.
692. William Henry Barlow and James Samuel.
702. Robert Lewis Jones.
720. Emanuel Berger and Jules Edouard Matile.
722. William Ramsey Nevins and Joseph John Yates.
730. Joseph Pimlott Oates.
732. Henry Bradley and Elmit Wray.
738. Henry Martin.
782. Charles Weiss, Henry Lister, and John Mitchell.
783. John Parker.
785. John P. Jourda.
788. Isaac Atkin and Marmaduke Miller.
837. William Somervail.
858. Edmund Alexander Spurr.
902. William Smith.
934. John Henry Johnson.
938. George Spencer.
950. John Henry Johnson.
994. Alfred Vincent Newton.
999. John Atherton Molineaux.
1172. William Edward Newton.
1195. William Armand Gilbee.
1268. Louis le Chevalier Cottam.
1363. George Crawford.
1375. Isaac Whitesmith and William Whitesmith.
1377. David Carter.
1448. Benjamin Hornbuckle Hine and William Onion.
1479. William Edward Newton.
1480. Robert J. Hendrie, jun.
1535. George Hornsey.
1538. Lazare Prosper Lambert-Alexandre and Louis Pierre Felix Mallet.
1608. Isaac Whitesmith and William Whitesmith.
1662. Chapman March.
1680. James Cocker.
1699. Alfred Vincent Newton.
1720. Robert Rennie.
1873. Frank Clarke Hills.

September 8th.

675. Clement Sharp.
677. Frederick Shand Hemming.
679. George Davies.
681. Samuel Faulkner.
682. Edward Cook and James Stokes.
683. Henry Richard Smith.
684. Frederick Simpson.
691. Andrew Knox and Thomas Robson.
694. Frederick Alexander Fitton.
695. James Edward Duyck.
699. Charles Reynaud.
700. James Hamilton.
701. Charles Baylis.
711. Joseph Jules Derriey.
729. Henry Bridges.
734. George Marshall.
737. Henry Glaysher.
740. Jules Moes.
775. William Gwillim Merrett.
778. Joseph François Maire.
824. Samuel Fox.
912. François Auguste Laurecisque.
1164. Matthew Smith.
1262. Edward Davis.
1452. Anton de Schuttenbach.
1494. James Savory.
1822. Gustav Adolph Buchholz.

PATENTS ON WHICH THE STAMP DUTY OF £50 HAS BEEN PAID.

August 31st.

2070. Thomas Clayton and Robert Harrop.

September 1st.

1937. William Brownfoot.
2035. George Frederick Evans and Frederick John Evans.
2053. Henri Catherine Camille de Ruolz and Anselm Louis Maire de Fontenay.
2084. Alfred Vincent Newton.

September 2nd.

1945. James Eden.

September 3rd.

1928. George Mackay Miller.
1956. James Burns.

September 5th.

2019. William Henry Dawes.

Journal of the Society of Arts.

FRIDAY, SEPTEMBER 18, 1857.

EXAMINATIONS.

Mr. Frank Marshall and Mr. Henry Cullum, two of the members of the Evening Classes, Crosby Hall, have been appointed to clerkships in the Education Department of the Privy Council Office, having been placed first and second on the list of successful competitors. Both gentlemen were in the list of prizemen at the Society of Arts Examinations in June last.

THE COMMERCIAL PRODUCTS OF AFRICA.

On Wednesday, the 9th inst., Dr. Livingston met the members of the Chamber of Commerce, Commercial Association, and Cotton Supply Association, at the Town Hall, Manchester, and afforded some interesting information in reference to this subject. He began by stating his opinion that the African ought to be encouraged to cultivate the raw materials of English manufactures; and he was so fully convinced of the elevating tendency of lawful commerce, together with the probable influence which the course specified promised to have on the slave trade and slavery, that he proposed to devote the next few years of his life to special efforts in that direction. Our demands for sugar and cotton were daily increasing. Those demands were at present met in great measure by slave labour; but the great body of Anglo-Americans would unquestionably prefer to have their wants supplied by freemen, and he ventured to hope that the discovery of a new region, well adapted for raising those articles, might be an opening for enabling us to escape from our anomalous position. The country through which the Zambesi flowed was abundantly watered by the numerous rivers which joined it. South of latitude 20 deg. there was a country remarkably destitute of water, where one might travel four full days without obtaining a single drop, there being no rivers south of that line; but the country to the north of it was totally different. In the south the vegetation was altogether thorny, there being a prodigious number of different kinds of thorns, the northern and well-watered country produced a vegetation without thorns. The majority of the trees there were evergreens; many of them had the appearance of laurels and orange trees. In that country there were a great many different kinds of fruits, most of which he believed to be totally unknown to Europeans. He brought home about 25 or 26 different kinds of fruit, some of which were valuable as yielding oil; and in the central part of the country called Lunda, where the seeds were abundant, the fleshy part was eatable, and the oil was used by the natives for anointing their bodies. Among so great a variety doubtless some must be good for food, though, perhaps, from having been usually pretty hungry, he could not be supposed to be a very good judge. Nearer to the coast, eastwards, the people cultivated large quantities of cucumbers, and their best salad oil was made from the seeds of cucumbers. Throughout the whole country the ground nut was cultivated in large quantities, used for food and for oil; and they had also castor oil throughout the country, their only use for it being to anoint their heads and bodies, though it was not a very agreeable unguent.

With reference to the subject of dyes, Dr. Livingston said, in Angola, the natives were acquainted with a great variety which they were not very willing to make known to Europeans. The Columba root was exported by the Americans in abundance, as a dye-stuff, and grew along the Zambesi river. Besides this there was throughout the country indigo—the kind called the silver indigo, with which the people dyed their clothes, and which grew wild, for it was not at all cultivated. The only exportation of it was by the Portuguese who lived at Tete, but it might be exported abundantly.

In reference to cotton, Dr. Livingston added that very large quantities of it were cultivated by the natives, and one small district between the rivers Conza and Loanda produced 1,300 cloths annually of cotton grown by the natives, spun by the women and woven by the men. It grew abundantly on the west, and that was by far the best field for cotton. On the east it was cultivated a little, but it was not so good. It clung to the seed, and an iron roller had to be used to separate it. The quantity grown on the east side was very much smaller than that on the west side, but the natives had never been induced to cultivate cotton; they had never been offered anything for it, and they only cultivated a little to make cloths for themselves. He believed if they had a market they would cultivate largely, for wherever they had the opportunity of selling anything, they immediately began to collect it. In the great valley to the east of Angola, the grass was generally so high that when on his ox he was obliged to hold up his hand to keep it out of his eyes. The natives never employed any manure, and the more the ground was worked the more fertile it became. The whole of Angola, if it had been in the hands of Englishmen, would have produced much more cotton and sugar, for its size, than any part of the southern States of America. Coming down the Zambesi to Tete, he found that, somehow or other, information had got out there that the *Times* newspaper had offered a reward of £1,000 for a fibre for making paper. His opinion was asked as to whether the report was true. The only answer he could give was, that if the *Times* had said it, the £1,000 was certain, if they could only get the proper fibre. He then advised them to get some of the fibres they had in abundance, which might be used in the manufacture of paper. They brought a kind of aloe, and another soft fibrous substance, found round the roots of the wild date tree. Neither of these would be good for the purpose; but they likewise brought another, termed buaze, which he had known simply as used for making threads to string beads upon. In other parts the sinews of animals were used for that purpose, but this root was quite as strong, and when one attempted to break it, it felt as if it would cut the finger. He brought home some of it, and presented it to Pye, Brothers, in Lombard-street, who gave as their opinion, after consulting one of the first manufacturers in Leeds, that the fibre was finer and stronger than flax, and it was worth between £50 and £60 a ton. This plant was probably not known to botanists at all; it was said to grow abundantly on the north bank of the Zambesi, but was never cultivated. The north bank was much more fertile than the south bank. There was a trade between Loanda and Brazil in wax, which was necessary for the churches in Brazil. This trade had been developed in Angola, and in the central country of Lunda; as they passed through the dense forests, he and his party observed that the natives had placed hives, every few hundred yards, between the trees, and seemed to collect every ounce of wax. The Portuguese gave a very good price for it in Angola. The country abounded in honey, and the travellers were called by the honey-bird three or four times every day. It invited persons to follow it and take the honey, and his men got a good deal of it. This had never been made an article of export. Some of the men endeavoured, without success, to sell their wax at Tete. If they had a market, he believed the natives would cultivate articles of produce with eagerness. When he travelled into that central country, endeavouring to find a path to the sea, he found the natives were equally anxious to go to the sea, to have traffic with the white men. It was a long way from Tete, and by the time he got there all his goods were expended, but the chief fitted him out with 15 oxen and canoes, and 27 men, and sent presents of butter and fat to the chiefs in Loanda. The men went all the way to Loanda without hope of wages, though he afterwards paid them. Whilst there they worked and collected all they could to take back to their own country of articles from the white man's country, where everything beautiful came from; and though, owing to continued detentions, sometimes by his own fever, and sometimes by that of his men, they returned as poor as they set out, they were received with the greatest kindness, because they had opened up the path. The people had no idea that sugar could be got from the sugar cane, although the sugar cane abounded in their country, and when he told them of it, the chief asked him to make some. He explained that it could only be done by a machine. Then, asked the chief, would he bring him a machine from his own country? He explained that he was a poor man, and it required something considerable to purchase one. The chief replied, " Why, the whole of the ivory of the country is yours, and if you leave any of it it is your own fault." The chief gave him a commission to the east coast, and fitted him out well a second time, all in the hope of having intercourse with the white men.

Upon the subject of cereals, Dr. Livingston said wheat had never been tried in the central country. The Portuguese came to Angola to make a little money and go back to Portugal, and they devoted themselves entirely to the trade in ivory and beeswax. The country produced beautiful wheat, and he saw it growing on the high lands with ears the length of his hand. The high lands produced it without irrigation, and it might be grown there to almost any extent. It was quite remarkable that the Portuguese did not cultivate it, because they paid the Americans handsomely for all the flour and biscuits they consumed; and he found they had Irish butter from Cork. The east side of the country also produced wheat. The Zambesi overflowed large tracts of country annually, like the Nile. The Portuguese had been in the habit of cultivating the wheat on that side of the country; all it required was that a slave woman with a little hoe should make a hole in the ground, drop a few seeds in, and push back the soil with her foot. In four months there was a crop of beautiful wheat. This simple operation answered all the purposes of our subsoiling, ploughing, draining, liming, and manuring. The higher they went up, the better the wheat was. At Zumbo, the grain was twice the size it was at Tete, where it was rather small. It had never been tried in the high lands in the interior. The country ascended eastwards from the west coast to a height of 5,000 feet above the sea; then it descended into the central valley, where the rivers on both sides contributed to the Zambesi in the middle, and this river flowed from north to south, leaving the valley by a fissure or creek in the ridge, of 30 miles long, which formed the most beautiful sight he had seen in Africa. There were two ridges on that side of the valley, one of 5,000 feet. The bottom of the valley and the coasts were very unhealthy, but the high lands were very healthy. The central hollow contained herbage excessively rank. The healthy ridges were remarkably well adapted for the production of grain. The natives cultivated a kind of millet, often called Kaffir corn; another kind of millet, somewhat larger; and likewise our own millet.

In general the sheep there had hair instead of wool, although, inland from Benguela, there was a long stretch of cold, elevated country, where the sheep actually had wool, and cattle flourished remarkably well.

With regard to metallic produce, Dr. Livingston said, throughout the country there appeared to be plenty of knives, axes, and hoes, and near the sea there were igneous rocks shot up, with fine iron ore. The Portuguese government employed the natives in working iron. At Kasembi a good deal of malachite was found. He had not seen copper ore in its proper place. A number of the native hoes had been made into an Enfield rifle for him at Birmingham, the maker pronouncing the metal very good, resembling, but not equal to, Swedish or Russian iron. It abounded along the Zambesi.

In reply to several inquiries, Dr. Livingston said there were extensive tracts of forest land. There were nine seams of coal. He examined one near Tete, which was about 68 inches in diameter, the coal having been tilted to the surface by volcanic action. Lieutenant Hoskins, who had command of one of the gunboats now gone to China, had given his opinion that the bar at the real mouth of the Zambesi was no impediment to commercial purposes, as there were 22 feet of water upon it, and, though the river was rather tortuous, he would not hesitate to take up a steamer of the same capacity as his gunboat. The river was at the flood during four or five months of the year.

Having been asked what article, as a medium of commerce, he thought the natives could best cultivate at the present moment, Dr. Livingston said that he believed cotton would be the best for them to begin with, and that they would cultivate it, if they were assured of a market. Now that they had abundance of land, they did not feel the necessity of improved cultivation. He described the feeling of the natives as strongly in favour of the English, whom they contrasted with the Boers and Portuguese. In the west, the population was very much milder in character than in the east. The possession of a single cannon was quite enough to overawe a whole district. As to the effect of the climate on the English constitution, the most important point he had ascertained was that there were two healthy ridges in the country. The Portuguese authorities had treated him with the greatest kindness, and appeared to regard his labours as favourable to the extension of their commerce. In Angola, skilled labour was to be had for 4d. a day; field labour for 2d.; and he believed it might be got by paying in calico, the usual currency of the country, at about 1d. per day. He proposed, in going back, to distribute cotton seeds amongst all the chiefs on the banks of the river, and endeavour to give the impression that all they produced would be purchased. The beginning must necessarily be small, and not profitable; but he thought if the natives could be engaged in lawful commerce it would put an end to the slave trade in all that central region.

At the conclusion of the meeting, the following resolution was proposed by Mr. J. A. Turner, M.P., and unanimously agreed to:—" That this meeting desires to express their warmest thanks to Dr. Livingston for his visit to Manchester, to record their appreciation of the importance of his discoveries, their high sense of his noble exertions for the extension of knowledge, as well as his self-devotion in again seeking to visit those hitherto unexplored countries with a view to their civilisation by the aids of Christianity and commerce. That, feeling a deep interest in the self-denying labours of Dr. Livingston, this meeting earnestly requests her Majesty's government will place at his disposal a steamboat, duly appointed and capable of ascending the navigable portion of the Zambesi, with such further accommodation in boats and otherwise as may be deemed sufficient for the exploration of its tributaries, and for obtaining and retaining friendly relations with the natives of that interesting region; the public bodies now assembled pledge themselves to use their utmost exertions for the promotion of these objects. That this meeting desires to impress on her Majesty's government their earnest desire that the aid of the Portuguese government should be specially requested towards facilitating in every possible manner the further researches of Dr. Livingston in the interior of Africa, and more especially in the districts surrounding the river Zambesi and its tributaries.

That a sub-committee of the following gentlemen, being the chairmen of the public bodies here assembled, be empowered and requested to carry out the resolution of this meeting, with power to add to their number:—Mr. John Cheetham, M.P., Mr. J. A. Turner, M.P., and Mr. T. Bazley."

The following is extracted from the *Manchester Guardian*:—We are glad to learn that the cultivation of cotton on the western coast of Africa, which has been commenced under the auspices of Mr. Thomas Clegg, of Manchester, continues to flourish; and Mr. Clegg received on Friday a bill of lading of 81 bales, shipped from Lagos, in the St. George, for Liverpool.

TELEGRAPH FROM EUROPE TO AFRICA.

The following report has been issued by Messrs. R. S. Newall and Co.:—"A telegraphic despatch from Cagliari, dated Sept. 9, announces to us that the submarine cable connecting Europe and Africa has been successfully laid. The communication between Teulada and Spartivento (a distance of 17 miles) has to be made before a regular telegraphic communication can be opened with Algeria. The cable is a heavy one, with four conducting wires, and has been successfully laid in above 100 nautical miles of 1,600 to 1,700 fathoms of water; the total distance covered is 124 nautical or 145 miles." It appears that the expedition under the command of Messrs. Newall, the engineers, started from Cagliari, on the Sardinian coast, with the cable in the hold of the Elba, and began paying it out, commencing on the African coast from Bona, on the Algerine frontier. Among the principal members of the expedition were the Cavaliere Bonelli, Minister of Telegraphs in Sardinia; M. Siemens, Minister of Telegraphs for Prussia; M. Brainville, representative of the French Government Telegraphs; with Mr. G. W. Brett, the concessionaire of the line and originator of the submarine telegraph system. Preliminary operations were commenced on Monday, and the entire cable was safely submerged, and communication effected with either coast, on Wednesday evening. The distance between Cagliari and Bona is 150 miles, an island of rock called Galeta intervening a short way from the African coast. The weight of the cable in the former experiment that failed was at the rate of 8 tons to the mile, whereas the weight of the cable now so successfully submerged has been reduced to about 1½ tons to the mile, and this, added to the perfection of the machinery for paying out, and the skill of the engineering manipulation, tended greatly to facilitate the operation under circumstances of much physical difficulty, since it was found, from the survey and soundings made by Engineer Delamarche, of the Tartarus, that the bed of the Mediterranean presented depths and inequalities, in the comparatively short distance of 150 miles, as formidable to be mastered as any in the Atlantic. For more than half-way across the depth is from 2 to 2½ miles, and the bed for nearly the other half rises abruptly to within half and a quarter of a mile from the surface. The bed of the Mediterranean, being of a soft chalk and shelly character, similar to that of the Channel, between Dover and Calais, furnishes an excellent place of deposit for the cable. There are four copper wires for the electric communications, twisted spirally one over the other. Every assistance was afforded by the French and Sardinian Governments to the company, who have an exclusive privilege granted them for 50 years by the two Governments—the French Government giving a guarantee of interest of 4 per cent. on £180,000, and the Sardinian 5 per cent. on £120,000. About one-half the quantity of cable required to extend the Mediterranean telegraph from Sardinia to Malta, and from Malta to Corfu, is manufactured; and as soon as the other half is ready, these places will be brought into the range of telegraphic connection with England and the Continent.

HONDURAS INTER-OCEANIC RAILWAY.

The engineer corps of this Railway report that they are rapidly progressing with the location of the road. The Atlantic division had completed the section of the line, 43 miles, to Portrillos, and had advanced to join Mr. Trautwine, between Yojos and Ojos de Agua. Mr. Gliddon, deputy agent, had reached the capital, where he had been well received. Lieutenant-Colonel Staunton, R.E., late member of the commission for settling the European boundary of Turkey, and Serjeant James Finch, R.E., have left for Honduras to review the work now in progress, and to give a general report to the Government on the route. The following extract from a letter of Mr. William Whitehead, one of the assistant engineers on the Honduras Inter-oceanic Railway, dated San Pedro Sula, the 14th of July, affords further details:—"I shall soon move with my party 15 miles from here, to Plau, and from there we shall take another long stride, perhaps to Yojos. Some one about Omoa has started a project to have a monthly or semi-monthly steamer to run thence *via* Belize to Havana. In that case we will have a regular mail route on both sides, and can send letters with certainty either way. As to our survey, as far as we have gone, we have got a beautiful first-class cheap road, with easy grades and very light curves. We are 40 miles from Puerto Caballos, and have risen 125 feet only." Colonel Kinney, in a private letter to a gentleman of New York, says:—"I shall leave to-day for Belize, and return to San Juan *via* my possessions on the Mosquito shore, with a view of coming back to establish myself here to lend a helping hand to the great railroad, which I regard as the leading enterprise of the age. When in New York, and until recently, I had my doubts as to the practicability of joining the oceans through Honduras, but since I have come on the ground, with the knowledge I possess, founded on the experience I have had in public improvements, I am satisfied that the work is not only feasible, but, in one word, the route between the seas."

COLONIAL PATENTS.

The following is extracted from the Transactions of the Royal Society of Arts of Jamaica:—

The following is the report of the committee on the subject of patents for inventions, referred to in the minutes of the Council Meeting, held on the 13th May, 1857. Although a memorial embodying the sentiments of said report has already been presented by the Council of the Society to the Honourable Executive Committee, yet the Council, being anxious to elicit discussion on this very important matter, respectfully solicit the communications of members or others willing to offer their views, opinions, or suggestions, addressing the same to the secretary for their due presentation to, and attentive consideration by, the Board:—

To the Council of the Royal Society of Arts,—

Your Committee appointed to inquire into the operation of the laws relating to patents for inventions in this colony, and to consider whether any, and if any, what alterations are required to suit the present exigencies of the community, and to evoke that spirit of competitive ingenuity, and encourage that originality of conception, which are found to exist, in a greater or less proportion, among all classes of men, have met and considered the important subject committed to their charge, in all its prominent bearings; more especially with a view to lend a helping hand to humble, without detriment to more aspiring, genius, by placing within the reach of the less wealthy classes the means of securing to themselves a property in their own discoveries, which shall stand a registered protection in their favour, at a moderate and attainable cost.

Your Committee report that they have carefully considered the provisions of the statute 15 and 16 Vic. c. 83, passed in the year 1852, and at present regulating the law of patents for inventions in the mother country; and they find in that statute so much that is applicable to this colony, that, with certain reductions of the items of expense to be incurred in the process of taking out a patent, they think, *mutatis mutandis*, it might be beneficially enacted here. They see the elements of such a commission as is constituted under the statute in England existing here, in the persons of their Honours the Vice Chancellor, her Majesty's Attorney-General, and the members of the Executive Committee, with such additions as the legislature may think fit. To a board consisting of any three of this body, the applicant for a grant of letters patent, or other documentary title equivalent thereto, might go by petition, leaving his statement in writing, or provisional specification, describing the nature of his invention, at the office of the Commissioners at the same time.

Your Committee do not deem it necessary to detail the process through which this petition and declaration must pass, under the statute, before the certificate of allowance is granted; suffice it to say, that they think the same process would be necessary here, in order to guard the public against spurious or unworthy claims. The certificate of allowance, when granted, would afford the applicant provisional protection for months, before the expiration of which period the letters patent must be taken out, or the inventor would lose his right to them. A register of patents, and also a register of proprietors would have to be kept in the office of the Commissioners, open at all convenient times to public inspection, under proper regulations. The scheduled fees, on taking out letters patent in England, are £15 for the provisional protection, and £10 more for the letters patent; and this original cost seems small enough. But it must be remembered that costs would be payable to the law officer of the Crown, as well as to such mechanics, artisans, and other scientific persons as he might find it necessary to consult, before the invention would be ripe for provisional protection, and consequently before a certificate of allowance would be justified. These fees might be fixed at a low and encouraging scale; but in consideration that they would, in most instances, amount to a sum little below £5, which ought to be made the maximum preliminary cost, your Committee recommend, should the legislature be induced to entertain their views, that in Jamaica the cost of the provisional protection should be £10. instead of £15, as in England; and the cost of the letters patent, £5, instead of £10. Thus the maximum cost, from the lodging of the petition to the vesting of an exclusive right of property in the invention, by the issuing of the letters patent, including the preliminary cost before mentioned, would be £20. In cases of opposition, of course, incidental costs would be incurred, which, however, it would be in the option of the inventor to risk or not, as he might think proper. There is a provision in the English statute that £50 additional shall be paid on the letters patent, at the expiration of the third year after their coming into operation, and an additional £100 at the expiration of the seventh year. Your Committee are of opinion that the principle of this provision should be adopted here, reducing the sums to £25 at the end of the third, and £50 at the end of the seventh year, leaving it optional with the patentee to abandon the protection of his patent, or pay these sums at the expiration of such periods respectively. For, if the invention is sufficiently profitable to the proprietor, it is only fair that he should contribute a portion of his profits to the revenue of the country which has given and protected his exclusive right to them.

While thus seeking to protect native talent and ingenuity, your Committee respectfully suggest that every facility be afforded to strangers and foreigners, in registering here the patents they have obtained in other countries, not only with a view to the information and instruction of our own people, but as a guide to the commissioners of patents, in ascertaining the novelty, utility, and originality of such specifications as may be laid before them for protection, as well as to guard against foisting on the community stale and exhausted inventions.

Keeping, therefore, in constant view the two grand principles which constitute the validity of every patent; first, that every invention for which protection is sought by letters patent must be new, useful, and original; and secondly, that every specification lodged by a patentee must be so clear, that at the expiration of the term for which the invention is protected, the public may have the benefit of it, as cheaply and as fully as the patentee himself had during his term.—Your Committee recommend that a memorial, embodying the result of their labours, be prepared, and respectfully submitted to the honourable the Executive Committee, praying for legislation in the spirit of this report.

WM. IRVING WILKINSON, V.P.
RICHARD HILL, V.P.

GNOLL COLLEGE.

The council of this college, which is situated in the Vale of Neath, and is about to be incorporated as the Western University of Great Britain, have at length elected their staff of professors, and are about to commence operations in the course of October. The professor of mathematics is Mr. Arthur Cayley, F.R.S., and barrister-at-law, late Fellow and Tutor of Trinity College, Cambridge, and moderator and examiner in that university. He was senior wrangler and Smith's prizeman in 1842, and is the author of several papers in the "Philosophical Transactions." The chair of mechanics they have conferred on the Rev. C. B. Wollaston, of Exeter College, Oxford, vicar of Felpham, Sussex, and diocesan inspector of schools; and that of physics on the Rev. A. Bath Power, one of the honorary examiners of the Society of Arts, and formerly superintendent of electric telegraphs on the Norfolk railways. Professor Rodgers, well known as a lecturer at the school of medicine adjoining St. George's Hospital, London, is to be professor of chemistry, while the chair of natural history will be filled by Dr. Spencer Cobbold, lecturer on botany at St. Mary's Hospital, Paddington; that of human history by the Rev. A. Wilson, late senior tutor of Leamington College; and that of design by Mr. E. H. Wehnert, member of the New Society of Painters in Water Colours. The professors will be assisted by resident tutors and lecturers. The object of the institution, to use the words of their prospectus, is "to complete the education of the sons of gentlemen above 16 years of age, in the practical application of science to the management of land, manufactures, and commerce, to the public services, the liberal professions, and other pursuits."

ON THE MEANS OF REGULATING THE SPEED OF MARINE STEAM ENGINES.

The following is an abstract of a paper read before the Mechanical Section of the British Association at Dublin, by Mr. Thomas Silver, of Philadelphia, U.S.:—

The author pointed out the defects in the common Watts, or centrifugal governor, which was affected by the pitching of the ship in such a manner as to become almost useless under certain circumstances. Hence the necessity of some efficient means of limiting the action of the marine engine to the speed that its strength will bear, has been heretofore one of the greatest wants of marine engineering, and deprives the steam ship of many advantages that are its due. Having mentioned several instances in which vessels were wrecked and many lives lost solely from the action of the machinery, which could have been controlled by a proper governor, the author stated that the U.S. steamer "Atlantic" (Captain West) had been running two years past with the attachment of a form of governor which he had invented, and had broken nothing; and the officers of that ship had frequently stated that they could save two or three miles an hour in following seas by the use of this instrument. This was proved to be the case by the fact that her eastern passages for the year 1856 were on an average each five hours shorter than those of the "Baltic," which is known, when under the same circumstances, to be the faster ship. The paper then continued:—"The screw (and it will soon be the only plan of steam propulsion over the ocean) increases the demand for some practical improvement in the marine engine that will facilitate the proper application of the steam under all circumstances, and I therefore wish to explain a plan of governor, the action of which is as analogous to the old centrifugal governor as the spring balance of a watch is to the pendulum of a ~~clock—the watch being~~ rendered by that improvement quite as valuable for preserving the uniformity of time, whether in our pocket, on a fast trotting horse, or under the pillow; whilst the clock must be confined to a fixed position, and this is attained on similar principles, differing, in fact, only in mechanical arrangement to make it applicable to governing the flow of steam, that is to say, in the governor which I have now the honour to submit to the section G of the British Association, the arms of an ordinary centrifugal governor, each extended to an equal distance beyond their axis of motion, and loaded at their four extremities with balls of equal weight, perfectly balancing each other. Thus the influence of the force of gravity is entirely evaded, and a spiral or reacting spring is substituted to resist the centrifugal force in the action of the instrument, each loaded arm oscillating in an opposite direction to the other, which serves to keep each of them at equal angles with the spindle that bears them. Hence the instrument will not only work with equal facility in any position, whether fixed, horizontal, perpendicular, or angularly, but it also can be thrown about at pleasure, without affecting the truthfulness or sensitiveness of its operation, and as its centrifugal force is resisted mechanically, instead of the force of gravity, as in the ordinary governor, we can increase its powers of action to any extent, so also we can increase the force of the spring, and thus more nicely and readily effect the same object. This fact, connected with the driving point being in the centre of the rigid arms that bear the weight, renders the instrument extremely sensitive and quick in action, and it may not be out of place here to mention, that it is now applied for regulating stationary engines employed for driving metal rolling mills, printing presses, and in many other situations where the machinery had been entirely uncontrollable by the best forms of governors previously tried." Captain James West, of the steam-ship "Atlantic," who has had the greatest experience with it, says, as a safeguard to the ~~machinery of a steamship~~ it is invaluable, and the object of the originator is effectually accomplished by it.

A model of Mr. Silver's governor was exhibited.

SOUTH KENSINGTON MUSEUM.

During the week ending 12th September, 1857, the visitors have been as follows:—On Monday, Tuesday, and Saturday, free days 2,997; on Monday and Tuesday, free evenings 5,863. On the three students' days (admission to the public 6d.), 367; one students' evening, Wednesday, 102. Total, 9,329.

Colonial Correspondence.

NEW COMMERCIAL PRODUCTS OF BRITISH HONDURAS.

Sir,—It will be a gratifying fact to those who take an interest in the prosperity of our colonies, that Honduras has at length taken a step, and a very decided one, in the right direction. From the time of the early buccaneers, or filibusters, as they were then called (from which the word freebooter is derived), down "to the present session of Parliament," mahogany and logwood have been the staple, indeed only, commodities of this country. Indeed, so exclusively did the settlers deal in those articles—so strictly did they confine their exports to the woods above mentioned, that a conclusion was arrived at that the soil was incapable of producing anything else. Whilst Jamaica, Barbadoes, and other West India islands were sweetening the cup——of tea, and contributing the ingredients of the social bowl, Honduras was simply sending the tables on which those enlivening materials were placed. But it is said that "there is reason in the roasting of eggs," so also was there a reason, and a sound one, why Honduras should not produce sugar and rum. Previously to the treaties of 1783 and 1786, logwood fetched in the British markets upwards of £100 per ton—a large sum in those days—and it was, therefore, much more profitable to cut and export that wood which grew spontaneously, than to cultivate, at much labour and expense, sugar, coffee, and rum, in which articles they would have had to compete with other colonies. By the treaty of 1786, the settlers were strictly prohibited from cultivating the soil for the purpose of exporting its produce. But that treaty is now as much in force as the statutes imposing a penalty for wearing covered buttons and requiring the dead to be buried in woollen shrouds. Mahogany and logwood have had their day, and the axe and the saw must now give way to the spade and the plough. The manufacture of sugar has been commenced in earnest. In three different localities the cane is now cultivated to a considerable extent. At Corosal in the northern district, on the New River, and at a place called New Boston, situated up the Belize River, excellent sugar is made. The demands of the colony are entirely supplied from these sources, and one very respectable shipment—for a beginning—has been made to England. A month or two ago Mr. Travis, of the firm of Hyde, Hodge, and Co., shipped to Liverpool, on board the *Byzantium*, one hundred barrels of sugar, and in the course of a little time he will have a larger cargo ready for exportation. The highly respectable mercantile house above mentioned, is entitled to the greatest praise for being thus the pioneer in this new path, which cannot fail to influence most beneficially the future destiny of the colony; and I think that the Society of Arts would do well to mark with their approbation the laudable course which it has commenced. But not only is sugar now made—rum is also manufactured. A very short time ago the duty upon imported rum contributed largely to the revenue. Now, the consumption of that article is almost exclusively confined to the home manufacture. These important facts present to the mind a vista of prosperity which it is pleasing to contemplate. Those who are acquainted with the rich soil and the inexhaustible resources of Honduras, cannot but see in them an augury of its future welfare.

The climate of Honduras is peculiarly adapted to the growth of the sugar cane, the regularity of the rains, and the great facility of irrigation arising from the innumerable streams and rivulets which intersect the country, insure a constant succession of crops. In many of the West India Islands, from the frequent occurrence of droughts, the sugar crop will always be a contingency. In Jamaica, Antigua, and Barbadoes, after the first planting, only one crop of ratoons can be obtained, and even that only by the application of a most expensive manure, which is more stimulating than enriching. In Honduras, after the first planting, ratoons may be obtained for 12 or 15 years without the aid of manure. In every colony there is a different period for planting, according to the peculiarities of the climate.

In Honduras the rainy season commences about the first week in June, and continues until the latter end of February or the beginning of March. The dry season then begins, and lasts for about three months. The cane must be planted between the latter end of June and the end of August; if it be deferred beyond that period, the young blade will be drowned by the heavy torrents which then set in. By January twelvemonth the cane will be mature, and it must be cut and housed before the end of May. After the first crop has been got in, every succeeding one will be ready for reaping in the month of January.

The supply of labour is in most of the West India colonies a question of considerable difficulty. In Honduras it is not an insuperable one. It is confidently believed that the whole of the Indian population of Yucatan can be induced to immigrate to this colony. The war between that race and the Spanish Mistetzoes began in 1848, it has gone on ever since, and at the present time it is raging more fiercely than ever. The feelings of humanity urge us as Christian men to do all in our power to bring to an end this fearful sacrifice of human life. If we had no other object in view but to stop this effusion of blood, that alone would be sufficient to justify our interference, more especially when the barbarous destruction of our fellow creatures is taking place almost at our very doors; when we can see the smoke of the carnage, and hear the shrill, agonising cries of the victims across the narrow stream which divides the countries. Already 15,000 Indians have fled to us for "safety and for succour;" others are daily following their example, for the steps of the pursuers are upon their heels, and the cry of the avenger is behind them.

But it is not from Yucatan alone that we are getting labour. Strange as it may appear, we are actually obtaining negro labourers from the islands. Mr. Blake has got 40 Jamaica negroes at work at Corosal, making sugar, and the company's steamship *Eagle* brought from the same colony 25 labourers in January, and 24 in July. We are on the eve of a great commercial revolution. The interoceanic railway across the Isthmus of Honduras, will attract hundreds of thousands of shrewd, intelligent, and observing travellers to this region; and the cultivation of British Honduras—which has begun, and must go on—will supply the English market with an abundance of products, for many of which we have been, hitherto, indebted to foreign countries and to slave labour, and will rouse our brother colonists from the lethargy which has so long deadened their faculties and paralyzed their limbs, and stimulate them to exertions which will restore to their former prosperity the beautiful green islands which stud the Carribean Sea, and cause them to shine—as once they did—across the western wave, "like a glory from afar."

I am, &c.,
R. TEMPLE.

Belize, British Honduras, Aug. 16, 1857.

Home Correspondence.

THE DECIMAL QUESTION.

Sir,—On my return to town a few days ago, I first saw the number of your *Journal* of the 28th of August, containing Mr. Miller's letter in answer to mine in that of July 31st. Of the tone of this letter I will say no more than that hard words are generally considered as a certain indication of a bad cause. With many of its statements I might be fully satisfied, inasmuch as, while professing to be corrections, they are in fact confirmations of my own; but a large part of it is devoted, not to the elucidation, but to the mystification of the subject. It is necessary, therefore, to say a few words, in order to re-establish the facts, not by inuendo, but by evidence.

When I printed my pamphlet on Decimal Coinage, I inserted in a note a statement which I had received from Mr. Haggard, then principal of the Bullion Office at the Bank of England. Mr. Miller now affects to believe that I did not report Mr. Haggard's words correctly, but he forgets that in his speech at the meeting of the Society of Arts, (see p. 508 of your *Journal*,) "he did not say that Mr. Haggard might not have said what was imputed to him," and he admits, in this very letter, that when the statement first appeared he "reproached Mr. Haggard with it," and most certainly without obtaining "a contradiction of it." This contradiction, he says, he never "in any way attempted to get;" if so, I am at a loss to know what was the object of his *reproaches*. As to my mistaking Mr. Haggard's meaning on account of my ignorance of the "technicalities" of the subject, if any of your readers will take the trouble of referring to my evidence, they will see that I state to the commissioners, "I give you the words exactly as Mr. Haggard used them to me," and I might have added that the words were written down and read over to him before we parted in the morning to proceed to our daily avocations. If your readers can find any "technicalities" involved in those words, they are heartily at Mr. Miller's service.

There is one other point connected with my evidence before the commissioners, on which it may be proper to correct Mr. Miller's inference. He says I am "not borne out by the printed evidence" in my assertion, that reference to Mr. Haggard's statement on that occasion was brought out by Mr. Hubbard's mode of examination founded on my pamphlet; and this I willingly admit. But I do not suppose that Mr. Miller himself will question, and I am sure that your readers generally will not be disposed to question, my re-assertion of the fact. Whoever has had experience of the printing of evidence as taken before committees or commissioners, knows full well how frequently the names of the questioning members are left out before the questions asked by them, and how constantly the answers to different questions get mixed up together in a rapid examination. This was the case in the present instance; Ques. 434 to Ques. 439 inclusive, were asked of me not by Lord Monteagle (as it would appear from the printed evidence), but by Mr. Hubbard, and were in continuation of his previous process of examination interrupted at Ques. 408. The printed evidence, however, shows, and shows correctly, that Mr. Haggard's statement was read from my pamphlet as part of the question asked me, and formed no part of my answer to it.

Having cleared the way of these personal considerations, for the introduction of which Mr. Miller is responsible, and not myself, I proceed to examine Mr. Miller's objections to the correctness of the statement in question. In the first place let me observe that the statement refers to the year 1854, and that Mr. Miller's observations bear reference to 1857. It cannot be doubted that in the intervening period the inconveniences of the new method have been diminished, as those of any other method would be, by constant practice; neither must we lose sight of the necessary effect upon the bullion trade, of the persistence of the Bank in recognising no other than the decimal weights. But neither of these results bear upon the argument in favour of the comparative superiority of those weights.

I come now, however, to Mr. Miller's contradictions of the statement itself. The first of them is a complete mystification of the real facts of the case. "For 10 years," he says, "prior to the gold discoveries in California and Australia, the average yearly influx and efflux of gold at the Bullion Office in the Bank were, both together, about £6,800,000, as may be seen by the parliamentary returns; the average of the last six years is £18,500,000, or nearly three times as much." But the question is not about "gold discoveries," but about decimal weights, and the parliamentary returns to which Mr. Miller refers, fortunately enable us to test the amount of business done in the Bullion Office before and subsequent to the introduction of that system. Mark now how a plain tale shall put him down! The decimal weights were introduced, as Mr. Miller tells us, in November, 1852—so late in the year that they could have had very little influence on the business of that year. The returns give, for the "influx and efflux of gold," the following results:—

1851.........	£11,947,119	average £18,718,597
1852.........	25,484,076	
1853.........	24,227,627	average £18,472,997
1854.........	13,912,490	
1855.........	20,711,162	
1856.........	15,040,711	

The average business for the two years previous to the introduction of the decimal weights was consequently nearly a quarter of a million in excess of the average of the four years succeeding it, the last year actually exceeding, by more than a million and a quarter, any year of the latter, and by ten or eleven millions two out of the four years of which it consists, and yet Mr. Miller wishes your readers to believe that "a recurrence to the old system would require additional force to carry on the business of the office."

But this is not all. For some years past the business of the Bullion Office has been almost confined to gold, a petty sum of £20,083 being all the silver that has passed through it since the introduction of the decimal weights. But within the ten previous years, that is to say, from 1843 to 1852, the "influx and efflux" of silver bullion had been more than £10,250,000 in value, or in *weight* (which is what we have to do with here), equal to £160,000,000 worth of gold, an average of £16,000,000 per annum (reckoned at its *weight* in gold), to be added to the business of the Bullion Office during the former period. Of this enormous item Mr. Miller, in estimating the business of the office, most ingeniously, I will not say how fairly, takes no account.

Secondly, Mr. Miller states "it is impossible" that the clerks in the Bullion Office could have referred to the tables showing the two systems, "because there never were any such tables in use." Now, the tables representing the new system were actually supplied by Mr. Miller himself, and have long been before the world under the title of "Decimal Tables used at the Bank." So much for that part of the subject. Does Mr. Miller mean to say that there were no similar Tables representing the old system? If he can shew that no such tables were in existence, I have to thank him for materially strengthening the argument against the new system, by proving that tables have been found necessary since the establishment of the decimal system, but were not needed while the former system was in force.

Thirdly, Mr. Miller complains that, in my evidence before the Commission, I did "not consider myself at liberty to mention the names" of the bullion brokers referred to in Mr. Haggard's statement. It is obvious that on this subject I must have relied on the information of others, and, consequently I could only have given them at second-hand; and if the Commissioners had really wished, or if Mr. Miller really wishes for their names, their obvious course would be to inquire of Mr. Haggard himself. Mr. Miller, however, gives the names of three firms, who are, he says, "by far the largest, if not the only bullion brokers, strictly speaking, in London." He adds, "the two latter firms use no other than the new system, and the first use it in all their gold transactions." Now, putting out of the question the difference between 1854 and 1857, if any of your readers will take the trouble of looking into the London "Directory," they will find, not three, but eight firms classed as "bullion brokers," to say nothing of those in Liverpool; and every one at all acquainted with the trade knows that in common parlance (whatever may be the interpretation of Mr. Miller's "strictly speaking") many of the numerous bullion dealers are spoken of as bullion brokers. I only mention this, however, to show the tendency of Mr. Miller's mind to mystify the plainest subject. On former occasions, he did not so attempt to limit the number of those engaged in bullion transactions, for in the very first sentence of the preface to his "decimal tables used at the Bank of England for reducing the gross weight of gold and silver to standard" 1854, he states that the governors had "*caused a large number* to be printed and given away *to persons engaged in the bullion trade*." Of this large number of persons he now enumerates three firms, "two of which," he says, "use no other than the new system," and the third "use it in all their gold transactions." Such is the result of more than four years continued pressure of the Bank of England under Mr. Miller's directions, which "either in gold or silver, uses no other (than the decimal) weights, and recognises no other." Even of the three firms enumerated, one is admitted to use the old system in its transactions in silver, in which the Bank, having ceased to do business, has no power to control. Can we wish for better evidence as to which of the two systems is generally preferred, when the pressure of the Bank is withdrawn? But is Mr. Miller really in earnest in asking for the names of brokers or bullion dealers who dislike the change, in order that they may be examined before the Commissioners? If so, he may call almost any of them indiscriminately; but that he may not make a mistake, perhaps it would be as well to begin with the first of the firms mentioned by himself, viz., Messrs. Sharps and Wilkins, whom I have often heard spoken of with praise by the importers of bullion, for the spirited manner in which they resisted what my informants called "the foolish innovation." So strong was this repugnance on the part of the trade, that all the influence of the Bank was unable to bring the new system into operation, even in its own transactions, without the aid of a permissive Act of Parliament to legalize what Mr. Miller had persuaded himself to believe that he could accomplish by means of influence alone.

Mr. Miller professes to reply to the questions which I had appended to my former letter; he does not, however, answer in his own person, but by an anonymous "statement" received from the Bullion Office. As I cannot personify the Bullion Office, I have no alternative but to consider the statement as Mr. Miller's own, and my information, derived from one well acquainted with the transactions of that office, leads me to the conclusion that this anonymous statement does not contain the whole truth, and that much of it is calculated to give an erroneous impression of the facts.

I regret that I am not at liberty to give the name of my informant, as he states that he is unwilling to subject himself to Mr. Miller's "reproaches."

In the first part of the statement, I find the usual enumeration of the "advantages of decimal weights," in which, as usual, facts are mixed up with opinions, which might be easily answered by equally strong facts and opinions on the other side of the question.

The paper also cites Mr. Haggard's theoretical predilection for a decimal system of coinage, of which I was fully aware, his papers having been enumerated in my list of publications on the subject printed by the Commissioners; and this always made me regard the unfavourable result of his practical experience of the new system as the more valuable and important. If others who are equally convinced of the ill-success of the system would state their opinions with equal freedom, we should hear a very different story from that contained in Mr.

Miller's "statement." Let him remonstrate, if he will, with the officers of the Mint, among whom, after more than four years' trial, he will find prevalent a strong feeling against the new system, which is called there by a name that I do not chose to repeat.

I come now to the so-called "Answers to Dr. Gray's Questions." There is some discrepancy in the answer to the first question—"The *increase of clerks* in the bullion office took place previous to the adoption of the decimal mode of weighing," and the statement in Mr. Miller's letter—"In August, 1852, it was found necessary to appoint *an additional clerk*." Which of these is correct? Does Mr. Miller mean to say that one clerk, or that more than one clerk, were appointed in that year? There was, unquestionably, a great pressure of business at the time, but preparations for the change to the decimal system were also then in progress, Mr. Miller's report, recommending its adoption, bearing date on the 28th of February. But my question was in the following terms:—"Whether the number of persons employed in the bullion office has not been increased *since the introduction of the decimal system*,"—a question that still remains unanswered, except "by inuendo," which I cannot admit. I have reason to believe that there are now employed in that office several more persons than there were previous to 1852. The answer to my second question is equally incomplete. It admits, however, that it is only in relation to gold, where they are controlled by the Bank of England, which "in all its dealings, either in gold or silver, uses no other weights, and recognises no other," that the London brokers "conform to the decimal mode." We have seen that the Bank's dealings in silver, since the introduction of the decimal weights, have been so trivial, that it is of no consequence to the trade in what manner silver is weighed at the Bank, and they consequently retain for it the old system, which they find most convenient. If their experience of the decimal system of weighing gold had been a favourable one, can it be doubted that they would, long ere this, have adopted it for silver also? And how can it have simplified their trade, that whereas they had formerly one set of weights and one system of computation for both silver and gold, they are now compelled, by the pressure of the Bank on the one hand, and by the general practice of the bullion trade on the other, to have two separate sets of weights, and two different modes of computation?

The answer to my third question is, under a thin disguise, entirely affirmative. Goldsmiths and jewellers, "whose weighing is" a most important "part of their business, follow the practice of Goldsmith's-hall," and consequently use the old system of weights.

I am quite at a loss to understand the negative answer given to my fourth question, in relation to the "tables of the value of foreign coins" used at the Bank. If Mr. Miller will take the trouble to enquire of Mr. Ellis, the principal of the Bullion Office, I have no doubt that he will show him the tables to which I refer. The business in foreign coins, let me add, forms an important part of the dealings of the Bullion Office, inasmuch, as during the year 1856, the purchases exceeded a million sterling.

The "answer" to my fifth question, asserting that "the troy grain is never used in bullion transactions," is in direct contradiction to the answers to the second and third, in which it is admitted that many "dealers" and "goldsmiths and jewellers," without exception, use only the old system of troy weight. That "the troy grain does not call for expression in the decimal system used at the Bank," in other words, does not admit of expression in it, is a strong objection to the system, inasmuch as that system divides the ounce into 1000 parts, while a comparison with the standard unit of avoirdupois, can only be made by considering the ounce as consisting of 480 grains.

To my sixth question, whether the cost of a set of decimal weights, such as those in use at the Bank, would not require a large extent of business to reimburse the outlay, it is replied that "a set of decimal weights is no dearer than a set of the old ones." I think there are obvious reasons why this statement cannot be strictly correct, and I believe that those who should rely upon it would find themselves mistaken. But one thing is clear; that as goldsmiths and jewellers, and most of the bullion dealers, use one set of weights, and the Bank of England another, those who have to do business with both must be at the expense of two sets where formerly one sufficed, and that this will not be worth their while unless they have "a large extent of business," especially if they are to be weights "covered with gold," like those used at the Bank.

As regards the subject in controversy there are two principal points which I think may now be considered as established; firstly, that the argument derived from a supposed increase in the business of the Bullion Office since the establishment of the decimal system is entirely fallacious, the business having actually diminished instead of increasing; and secondly, that the system of weighing bullion by the decimal weights, although enforced by the Bank and tolerated at the Mint, has not, after more than four years' experience, extended itself to the bullion trade at large, but is confined, or nearly so, to those firms which are in immediate connection with the Bank.

Now, this latter point is almost the only one on which the subject has any practical bearing on the question of a decimal coinage. In the opinion of nearly all the advocates of the latter, the introduction of decimal weights is regarded as equally important; and the facility of the change, as well as the readiness of the community to adopt it, is continually dwelt upon. In this particular instance Mr. Miller says, in his report dated October 6th, 1852, "It should be observed that the class of persons engaged in the bullion trade are an educated class, familiar with calculation, whose calculations are generally made in the decimal form, and that they are a class best of all able to meet any little difficulty which a change of this nature is likely to bring with it." Well, to this educated class, so admirably prepared for its reception, this system has been offered for nearly five years; it has been enforced upon a very influential portion of them by the refusal of the Bank of England to deal with them upon any other terms; it has been rendered "as easy as possible" to them by a set of tables, prepared by Mr. Miller himself, of which "a large number have been printed and given away to persons engaged in the bullion trade," and yet the trade at large prefer the old system, and refuse to accept the proffered boon. Two inferences are inevitable; firstly, that they have no faith in the mighty advantages which it holds out; and, secondly, that if the "educated men, familiar with calculations, and whose calculations are generally made in the decimal form," steadily reject in their own particular trade a decimal system of weights, so much the more sturdily will the less educated classes, familiar only with existing money calculations in their ordinary form, reject a decimal system of coinage, interfering with and destroying all their ideas of value, and all their habitual modes of computation.

I trust that in this letter I have proved, to the satisfaction of your readers, if not to that of Mr. Miller, that, in his own words, I still possess "that nice sense which is necessary to distinguish between the truth and what only looks like it." I am, &c.,

JOHN EDWARD GRAY.

British Museum, 14th September, 1857.

Proceedings of Institutions.

Greenwich.—Two lectures, on "Life's Poetry," and "Douglas Jerrold," were given at the Society for the

Diffusion of Useful Knowledge, on Tuesday evenings, Sep. 1st and 8th, by James Kay Applebee, Esq., of Dacre-park, Lee. The lectures were very interesting, and were well received by large audiences.

KANDY (CEYLON).—The prizes given by the Agri-Horticultural Society were distributed by Mr. E. Rawdon Power, the President, on the 27th June last. Silver medals were awarded for the best samples of cotton, tobacco, fibres, and other important articles of export. The producers of the finest flowers, vegetables, fruit, live-stock, &c., were also rewarded. The official account says:—"The show of flowers was better than on any former occasion, as also were the specimens of gums, cotton, and vanilla; attention is being paid in several quarters to the production of these two latter valuable articles of export. When the mills for the manufacture of fibres, and which are stated to be both economical and simple in their construction, and are likely soon to be in the island, are in active operation, fibres will, doubtless, be exhibited at the future shows both in larger quantity and greater variety. It is proposed to send the specimens of cotton and tobacco to the Society of Arts in London, or to the Manchester Trade Association, for Report, &c."

SOWERBY-BRIDGE, HALIFAX.—On Tuesday, the 1st inst., a public meeting was held in the spacious room of the new Town-hall, which is being erected with the special view of affording sufficient accommodation for a Mechanics' Institute in this town. W. Edleston, Esq., occupied the chair, and the room was well filled, chiefly by the young men engaged in the numerous factories in the locality, and for whom the Institute is designed. After some preliminary observations, the Chairman read the report of a Provisional Committee appointed at a previous meeting. It stated that the failure of former Mechanics' Institutes in the town was mainly owing to the want of eligible premises, a difficulty which would be obviated by the building in which they were assembled, and which was nearly completed. There was a library of about 1,000 volumes, in very fair condition, which was subject to a debt of £33. The Committee proposed that the subscription to the new Institute should be 20s. a-year for first-class members; 10s. 10d. a-year for second-class members; and 8s. 8d. for third class members under 18 years of age. Mr. Barnett Blake, the agent and lecturer of the Yorkshire Union of Mechanics' Institutes, addressed the meeting at considerable length, pointing out the benefits to be gained, and the best means of accomplishing the end in view. He pointed out particularly the substantial advantages to be attained by the examinations of the Society of Arts, as evidenced in what had already been achieved. His remarks were listened to with great attention, and at the conclusion he was much cheered. A motion for the adoption of the report was carried by acclamation. A committee of management, for the preparation of rules, &c., was elected, and, before the meeting broke up, the names of a considerable number of members were enrolled by Mr. Samuel Fox, the Secretary.

PATENT LAW AMENDMENT ACT.

APPLICATIONS FOR PATENTS AND PROTECTION ALLOWED.

[*From Gazette, September* 11.]

Dated 17th July, 1857.

1980. Charles Barlow, 89, Chancery-lane—An improved brick-making machine. (A communication.)

Dated 23rd July, 1857.

2024. Charles Fréderic Vasserot, 45, Essex-street, Strand—An apparatus for moulding candles. (A communication.)

Dated 27th July, 1857.

2042. Augustin Mortera, Paris—Improvements in coupling carriages on railways.

Dated 31st July, 1857.

2084. Isaac Moll, Cologne—An economical fire regulator.

Dated 5th August, 1857.

2116. Sebastien Botturi, Paris, Rue de la Roquette, 140—An apparatus and oven for the carbonization and distillation of all animal and vegetable matters.

Dated 8th August, 1857.

2136. George Collier, William Noble, and Ward Holroyd, Halifax, Yorkshire—Improvements in cutting, shaping, and planing wood, and in the tools and apparatus employed therein.

Dated 17th August, 1857.

2180. John Abraham, Birmingham—For a new or improved guage for guaging wire and sheet metal, and for other like purposes.
2182. Peter Carmichael, Dens Works, Dundee—Improvements in calendering and mangling cloth.
2184. François Xavier Poznanski, Craven-street—An improvement in instruments for ascertaining and indicating the state of the pulse, which improvement is also applicable to other instruments in which fluids are required to circulate or work in tubes of small bore.
2186. John Grist, Islington—Improvements in mash tuns, and in apparatus to be employed therewith, which apparatus is also applicable to the heating and keeping up of a continuous circulation of liquids in any vessel to which it may be connected.

Dated 18th August, 1857.

2188. Joseph Coupe, Preston, Lancashire—Improvements in power looms.
2190. William Henry Miller and Henry Edward Skinner, Shadwell—Improvements in rotary engines and pumps.
2192. Benjamin Lupton, Robert Jackson, Daniel Dean, and John Holden, Burnley, Lancashire—Certain improvements in power looms for weaving.

Dated 19th August, 1857.

2195. Sigismond Rosenthal, 2, Red Lion-square—Printing on both sides of a sheet of paper by a single impression on an ordinary lithographic or other press.
2196. Samuel Bottomley, James Bottomley, and Thomas Bottomley, Buttershaw, North Bierley, Yorkshire—Improvements in machinery acting upon, and in connexion with, rotary shuttle boxes for weaving checks, plaids, figured and fancy goods.
2197. Arthur Wall, East India-road, Poplar—Improvements in amalgamating metals.
2198. Arthur Wall, East India-road, Poplar—Improvements in coating metallic surfaces.
2199. Alexis Jean Dessales, 13, Rue des Enfants Rouges, Paris—An improvement in lamps for railway carriages, ships' cabins, and other oil lamps.
2200. Pier Alberto Balestrini, Brescia, Italy—A new method of, and apparatus for, sounding at sea and in other waters.
2202. Charles Fréderic Vasserot, 45, Essex-street, Strand—A smoke-consuming grate. (A communication.)
2204. Ferdinand Potts, Moore's-row, Birmingham—Certain improvements in the mode of cutting out, forming, and finishing certain descriptions of metallic tubes, part of which is also applicable for other such like purposes.
2206. Robert Clark Gist, 36, Cannon-street—Improvements in the manufacture of manure. (A communication.)
2208. James Murdoch Napier, Vine-street, York-road—Improvements in paying out submarine telegraph cables.

Dated 20th August, 1857.

2209. Robert Lawrence Brooke, 20, Keppel-street, Russell-square—Improved method for discharging, "paying out," and submerging electric telegraph cables, wires, or ropes, or such like articles, from ships or vessels of any description.
2210. Theophilus Gough and Joseph Margerison, Bristol—Improvements in braking apparatus for vehicles used on railways or on other roads or ways, parts of which are applicable for communication between guards and drivers of trains.
2211. John Gedge, 4, Wellington-street South, Strand—Improved means of heating buildings, and of facilitating the escape of smoke and gases therefrom. (A communication.)
2312. Richard Archibald Brooman, 166, Fleet-street—A new method of defecating sugar and other saccharine matters, and of refining or rectifying alcohol. (A communication.)
2215. Robert Taylerson, 5, Tryons-terrace, Hackney—An improvement in metal ships and vessels.
2216. Daniel Messmore, New York—An improved method of dressing millstones for hulling rice and other grain having hulls or husks. (A communication.)
2217. Thomas Ingram, Bradford, Yorkshire—Improvements in railway breaks.

Dated 21st August, 1857.

2218. William Kemble Hall, 36, Cannon-street—Improvements in apparatus for measuring and registering the speed and leeway of ships, and indicating the distance accomplished. (A communication.)
2219. Joseph Glover and John Bold, Liverpool—An improved material for transfer printing.
2220. John McMaster, Caldons, Stoneykirk, and William Wilson, Whithorn, Wigtown—Manufacturing liquid farm manure, and rendering it as efficient as any artificial manure, at a small expense to the farmer.
2221. Victor Hippolyte Laurent, Plancher-les-Mines, France—A new improved machine for forging nails and other similar articles.
2222. Peter Ashcroft, Richmond-house, Dalston—Alarm signals for the prevention of accidents on railways.

2223. Henry Cartwright, Dean, Broseley, Shropshire—Improvements in the construction of steam engines.
2224. John Dauglish, Great Malvern—Improvements in the preparation of dough.
2226. Henry Clarke, Chancery-lane—Improvements in the lines of steam vessels, and in the method of propelling the same.

Dated 22nd August, 1857.

2229. George Steele and William Steele, Kew-road, Richmond—The better construction of a double-backed double boiler for heating with hot water, churches, horticultural buildings, mansions, theatres, &c.
2230. Frederick Albert Gatty, Accrington—Improvements in the manufacture of chlorine and sulphuric acid.
2231. Thomas Settle, Bolton-le-Moors—Certain improvements in looms for weaving.
2232. John Pinchbeck, Katesgrove Iron Works, Reading—An improvement in screens for dressing or separating corn and other grain.
2233. Ludvig Levison, Birmingham—Improvements in mechanical purchases, to be employed for hoisting purposes, and for extracting roots and stumps of trees. (A communication.)
2234. Perry G. Gardiner, New York, U.S.—A new and useful process in the treatment of cast-steel while passing from the molten state into that of being hardened or tempered, and which, with certain variations, is applicable to the making of tools, instruments, axes, wheels, or ingots.

Dated 24th August, 1857.

2235. François Jules Blanc, 39, Rue de l'Echiquier, Paris—An improved tyre for the wheels of railway carriages, engines, and tenders.
2236. George Daniel Davis, Saint Leonard's-road, East India road—Improvements in the construction and in the method of working windlasses.
2237. Alfred Vincent Newton, 66, Chancery-lane—Improvements in temples for looms. (A communication.)
2238. Thomas Rickett, Castle Foundry, Buckingham—Improvements in machinery for sowing seeds and manure.
2239. Alfred Hamilton, Oxford-square—Improvements in the construction of and in mooring buoys, beacons, floating lights, and other floating vessels and bodies.
2240. Samuel Fox and Julian Wilfred Slater, Sheffield—An improved metallic compound, applicable to the manufacture of various useful articles.

Dated 25th August, 1857.

2241. Thomas Macauley, Shoreditch—Improvements in apparatus for condensing the noxious vapours arising from varnish-making and other like manufactures.
2244. Edward Riley, Droylsden, near Manchester—Improvements in looms.
2245. George Wirgman Hemming, 10, Belsize-road, St. John's-wood—Improvements in apparatus employed in delivering submarine telegraph cables from ships.
2246. Charles Clement James, Norwood-green—Improvements in propelling vessels.
2247. William Nichells, Chippenham—An improved apparatus for warming milk.
2248. Henry Parry, Croydon—Improvements in the construction of rails for railways or tramways.
2249. James Ronald, Liverpool—Improvements in laying or depositing submarine telegraph cables.
2250. John Penn, Greenwich—An improvement in apparatus for taking the thrust of screw and submerged propellers.
2251. Captain John Jervis Tucker, R.N., and George Blaxland, Sheerness—Improvements in steam boiler and other furnaces.
2252. Werner Staufen, Baker-street—An improved method of treating Agava Americana or Mexican grass, and the manufacture of a new fabric therefrom.
2253. Alfred Vincent Newton, 66, Chancery-lane—Improvements in machinery for preparing, roving, spinning, and twisting fibrous substances. (A communication.)
2254. Alfred Vincent Newton, 66, Chancery-lane—A mode of varying the length and reversing the direction of the throw of eccentrics, applicable to the reversing gear of locomotives, and expansion gear of other steam engines, and to other purposes. (A communication.)
2255. Philip Hill, Manchester, and John Moore, Salford—Certain improvements in machinery or apparatus for cutting velvets or other similar piled fabrics.

Dated 26th August, 1857.

2256. John Gedge, 4, Wellington-street South, Strand—Improvements in the manufacture of soap. (A communication.)
2257. Thomas Forsyth, Manchester—Improvements in machinery for raising, lowering, traversing, and compressing.
2258. William Hargreaves, Bradford, Yorkshire—Improvements in screw gills for preparing wool and other fibrous substances.
2259. Thomas Smith, Manchester—Improvements in machinery or apparatus for embossing woven fabrics, paper, leather, and other materials.
2260. Alfred Vincent Newton, 66, Chancery-lane—Improved machinery for kneading dough. (A communication.)
2261. Henry Elvin, Castle Acre, Norfolk—Improvements in governors for steam and other engines.
2262. Alfred Vincent Newton, 66, Chancery-lane—Improved means of operating slide valves for the induction and eduction of steam in reciprocating steam engines. (A communication.)
2263. James Goodwin and Andrew Boyd, Milton, near Campsie, Stirling, N.B.—Improvements in cleansing printed cotton and silk fabrics from colouring matters.
2265. Thomas Brown, Fenchurch-street—Improvements in machinery for raising and lowering weights.

Dated 27th August, 1857.

2267. William Harling, John Matthew Todd, and Thomas Harling, Calder Foundry, Burnley—Improvements in looms.
2269. Alfred Vincent Newton, 66, Chancery-lane—Certain improvements in bakers' ovens. (A communication.)
2271. Robert Aytoun, Edinburgh—Improvements in safety cages or apparatus for mines.

Dated 28th August, 1857.

2273. Andrew Shanks, 6, Robert-street, Adelphi—Certain improvements in machines for shaping and cutting metals and other substances.
2275. William Smith, Liverpool—An improvement in the manufacture of size made from gelatine.

Dated 29th August, 1857.

2277. Robert Whittam, Accrington—Improvements in machinery or apparatus for ruling upon metallic rollers or cylinders for printing calico and other materials.
2279. John Fisher, Carrington, Nottingham—An improvement in the manufacture of bobbin net or twist lace.

Dated 31st August, 1857.

2281. Joseph Gilbert, Eversham, Worcester—An improvement in combined thrashing machines.
2283. Philippe Roehrig, Paris—A new or improved fabric to be used for manufacturing petticoats and other parts of women's dress.
2285. Henry Brinsmead, Ipswich—An improvement in the beaters of thrashing machines.
2287. Lionel Gisborne and Henry Charles Forbe, Duke-street, Adelphi—Improvements in apparatus for paying out electric telegraph cables.

WEEKLY LIST OF PATENTS SEALED.

September 11th.

703. George Mountford.
721. Samuel Laurence Taylor and Thomas Eaton Rolfe.
727. John Wheatman and John Smith.
731. Martin Nunn.
747. Sir Francis Chas. Knowles, Bart.
754. William McCulloch and Thomas Kennedy.
779. Henry Hall.
805. Thomas Howard Head and Joseph Wright.
809. William Heap.
819. Robt. Hanham Collyer, M.D.
907. Alfred Vincent Newton.
921. Alfred Vincent Newton.
979. William Sullivan Gale.
1007. William Clark.
1243. Adolphe Louis Cauville.
1313. Francis Watkins.
1715. John Henry Johnson.
1929. Richard Hornsby, junr.

September 15th.

743. Nathaniel Jones Amies.
768. Joseph Lewis.
774. Marie Amedie Charles Mellier.
786. John Chedgey.
800. Matthew Augustus Crooker.
804. Bewicke Blackburn.
832. Pearson Hill.
838. Robert Cassels and Thomas Morton.
842. John Radcliffe, Jas. Fearnehough, and Joseph Mather.
882. Jean Eugène D'Arcet.
998. William Oxley and Hugh Strath.
1022. John Blythe Robinson.
1056. John Henry Johnson.
1086. Peter Armand le Comte de Fontainemoreau.
1210. John Henry Johnson.
1518. Charles Fleet.
1854. Matthew Clark.

PATENTS ON WHICH THE STAMP DUTY OF £50 HAS BEEN PAID.

September 7th.

1953. Henry Lund.

September 8th.

2009. Samuel Collins.

September 9th.

1978. John Norton.
2017. Samuel Crabtree.

September 10th.

1985. Charles Wentworth Forbes.
2064. William Palmer Surgey.

September 11th.

1994. Henry Crosley.

September 12th.

2001. William Bramwell Hayes.

WEEKLY LIST OF DESIGNS FOR ARTICLES OF UTILITY REGISTERED.

No. in the Register.	Date of Registration.	Title.	Proprietors' Name.	Address.
4017	Sept. 1.	The Conical Oscillating Valve	Francis Rokeby Appleby, of the firm of Appleby and Co.	Remshaw Iron Works, Eckington, Derbyshire.
4018	,, 1.	Improvement in Infants' Feeding Bottles	John Robert Dicksee	27, Howland-street, Fitzroy square.
4019	,, 2.	Stereoscopic Case	George Chambers and Co.	Russia-row, Cheapside, London.
4020	,, 8.	Improved Lever and Lever Plate for Counter Pumps	Robert Bromwich	Moor-street, Birmingham.

Journal of the Society of Arts.

FRIDAY, SEPTEMBER 25, 1857.

ON THE ECONOMICAL, EDUCATIONAL AND SOCIAL IMPORTANCE OF OPEN AND PUBLIC COMPETITIVE EXAMINATIONS.

At the recent meeting of the British Association at Dublin, a paper on this subject was read by Mr. Edwin Chadwick, C.B.

He said—If there shall be a fair inquiry into the causes of the waste of capital by the rebellion and war now going on, and as to the means of the prevention of future waste of capital—if India shall, for the future, be made to pay its own expenses, the economical test of good administration—if, indeed, that empire is to be held at all, those who have given the most serious consideration to the subject agree it must be by a reformed and superior administration, and that reformed administration must comprehend as its basis the extended application of assured qualifications for the service, tested on the principle which forms the subject of my address. I premise my reference to the statistics of the numbers of the examinations of the Civil Service Commissioners, during the last year, by stating that these numbers are not of competitive, but chiefly pass examinations, of the character of which I shall speak presently. It appears, from the report of the Civil Service Commissioners, that the total number of candidates for admission to the Civil Service, on whose cases they had adjudicated, from the 31st May, 1835, to the 31st December, 1856, is 3,000. Of this number, 60 were found to be not within the limits of age prescribed for admission; 12 were not physically competent for the duties of their situations; 10 failed to give satisfactory evidence of their fitness in respect to character; 99 were admitted without examination, upon reports from heads of departments; and 137 either declined to undergo the requisite examination, or withdrew without completing it. Of the remaining 2,686 who were actually examined as to their knowledge and ability, 1,587 obtained certificates of examination, 886 were rejected as not qualified, and 219 were unsuccessful upon competition. On the first adoption of the provision requiring examinations, there were loud outcries against the very difficult and unreasonable subject-matters propounded by the Commissioners for examination. I am much mistaken if most of the advanced charity school children of the National Schools of Ireland would not meet these difficulties successfully. Now, out of the whole number of 860 rejections, no less than 425 have been rejected for spelling alone, or with other subjects, except arithmetic; 147 have been rejected for arithmetic alone, or with other subjects, except spelling; and 263 have been rejected for spelling and arithmetic, with or without other subjects; "so that," say the Commissioners, "only 65 have, since the commencement of our duties, been rejected for deficiencies not involving spelling or arithmetic, or both." It is to be observed, then, and should be borne in mind, that the great bulk of these examinations are only pass examinations, and these for a low standard of mental qualification. The Commissioners speak, however, encouragingly on this subject. In their first report, the Commissioners had stated,—"We do not think it within our province to discuss the expediency of adopting the principle of open competition as contradistinguished from examination, but we must remark that, both in competitive examination for clerkships in our own and other offices, those who have succeeded in obtaining the appointments have appeared to us to possess considerably higher attainments than those who have come in upon simple nomination, and we may add, that we cannot doubt that if it be adopted as a usual course to nominate several candidates to compete for each vacancy, the expectation of this ordeal will act most beneficially on the education and industry of those young persons who are looking forward to public employment." In their last report, the Commissioners state that, during the past year, thirty-four competitive examinations of candidates for junior situations have taken place. "In these competitive examinations, however, the candidates competing for the respective appointments have, in most cases, not been sufficiently numerous to bring out all the satisfactory results which may be expected to arise from this system. Disregarding the competitive examinations which took place in our office, and which we shall presently notice, in the 33 competitions there have been only 222 competitors proposed for 61 situations, and of these only 158 actually competed,"—that is to say, there were on the average only three nominated competitors for one place. During the last year, it is to be observed that there were nominated and admitted to permanent clerkships without competition, 577 nominated, and 310 admitted. Now, it is to be observed, that these arrangements are not in the sense of the recommendations of Sir Charles Trevelyan, of the Treasury, nor those of the late Mr. John Wood, the Chairman of the Board of Inland Revenue, nor of Mr. Bromley, of the Admiralty, nor are they calculated to abate those evils of patronage nominations which, it was the testamentary declaration of the late Admiral Sir George Cockburn, were the great detriment and opprobrium of his profession—against which Admiral Sir Baldwin Walker, with so much moral bravery, contended; nor, I apprehend, do they accord with the views of distinguished officers in the army, nor are they in the sense of the recommendations of Colonel Larcom. But they are in the sense of Sir George Lewis, the avowed enemy of the principle, to whom its practical execution has fallen. In respect to the appointments without competition to the 310 places, a few examples may be given of the number of appointments to clerkships and higher offices made without competition during the last year in the larger departments of the State:—

	Nominated.	Admitted.
War Department	42	25
Admiralty	38	21
Inland Revenue	154	66
Post Office Clerks, London, Dublin, and Edinburgh	51	31
Constabulary Office, Ireland	211	113

Thus, there were only 61 situations, and those, I believe, at the instance of the more conscientious heads of departments, given in nominated competition as against 310 given without any competition whatever. We must assume that these 310 admissions were given generally "without those higher attainments" which the commissioners attest are elicited by competition, and that the appointments have also been without "the stimulus which exists in competitive examinations animating the candidate to display whatsoever talent he may possess applicable to the subject in which he is examined." In fact, the promise made as respects the application of the principle approved by Parliament and the public, it will be perceived, remains yet to be realised. The only cases in which proper competition can be said to have been fairly opened, are in the case of cadetships for the military service, and in those only in the Engineers and the Artillery, and not for commissions in the line. In the East India service there are competitive examinations for the appointments to writerships and medical appointments. I should observe that, before any deficiencies of the civil service had been made manifest during the last war, Sir Charles Trevelyan and other eminent civil servants had represented the need of repairing them. I may also claim to have expounded, a quarter of a century ago, the principle of the open competitive examination as the only efficient and trustworthy test of such qualifications as may be deemed requisite for admission to the public service, and I have invariably urged its practical adoption in my subsequent experience, in which I have had passed through my hands the applications of between 1,000 and 2,000 staff appointments, and have been employed in the business connected with the regulation of the expenditure of upwards of half a million per annum in 12,000 local appointments, besides much business connected with local dismissals. This has only confirmed more strongly my earliest impressions. I desire here to revert to the confident opinion I have expressed that the perils to which the empire is now exposed by the conflagration in India, and the charges to which it must be subjected, apart from all the destruction of life and other horrors, will, on a strict examination, be found to have been occasioned by the want of competent judgment and ability consequent on mere patronage appointments and defective administrative skill. A large proportion of the civil administrative functions have been exercised in India by young military officers. In respect to mere patronage appointments to direct commissions for the Indian army, an opinion may be formed of what they commonly were from the results of the mere pass examinations recently appointed. Thus in the years 1851 to 1856, both inclusive, there were examined 437 candidates for direct commissions in the Indian army. The candidates were generally sons of gentlemen of high social position. Of this number 234 failed to do common arithmetic, and 182 failed to spell their mother tongue. It was from the most accomplished civil servant of the East India service, my friend, Mr. John Mill, that I obtained the recognition of the value of competitive examinations, which he recommended in his evidence, and which he has so forcibly expressed in his paper laid before Parliament, with the other papers on the reconstruction of the civil service. It was in India, the present field of disaster, and as a civil servant, that Sir C. Trevelyan observed the great evils of mere patronage appointments, and became more anxious for the adoption of the principle of competitive examinations. Now, it would surprise the meeting if they were informed of the extent of jurisdiction and power of life over the natives which fell to these "fag ends" and bad bargains, as Sir Charles Trevelyan, in his evidence, called them. Sir Charles maintained that the competitive examination was the only trustworthy means for cutting off those same "fag ends." (Mr. Chadwick then quoted from the examination of Sir Charles Trevelyan, which showed the evils which the system of nomination through patronage had produced, in the incompetence of those appointed to cadetships and civil offices, in their bad effect upon those over whom they were placed, and the want of exertion on the part of parents to have their sons properly educated, and then proceeded.)—It might also have been said that by the system of Parliamentary and political patronage the civil administrative departments of the Home Government were being made sinks towards which the scum and refuse of boroughs habitually gravitate. But as an important illustration of the principle of safeguard, advocated by officers engaged in naval and military as well as civil administration. the proper competitive examination, I would call particular attention to the fact that the bad bargains and fag-ends were well known to the professors as well as to the other students; the cases in which the public were protected by their dismissal were rare indeed. I venture to assert, on avowals made to me by eminent examiners in medicine and in various educational institutions, that it may be taken as a general fact that in the system of pass examinations rejections are extremely rare, however frequent may be the failure of the strict or due proof of qualifications. And I would now call your attention to the principle of the competitive examinations for admissions to the public service. The general avowal I have met with is to the effect—One feels it to be a serious injury to a family to reject a candidate on whose education they have spent much money, and one cannot help being indulgent. Captain Basil Hall mentions the compunctious avowal of a pass examiner for naval commissions, that from regard to the interests of a family he had passed a young man with a lenient examination. The examiner heard afterwards of the loss of the ship and of all on board, apparently from some error of navigation, under the command of the officer whom he had examined; and he (the examiner) could not help feeling compunctiously that the loss of all that life was due to the exercise of the narrow sympathies and the lenient pass examination. And with the mere pass examination they (the examiners) avow it cannot be expected that such lenience will not prevail at the expense of the public. Now, it is of the essence of the examination, for the principle of which we contend, that there should be full, open, and free competition; I contend for it, because in proportion to the openness and publicity and the number of competitors, it forms the best practical security—it may be said, the only available practical security, against either undue lenity or the exercise of narrow sympathies on the part of the examiners, for it brings to the examination the security of publicity and the attendance of an intelligent and intensely interested public; of that public are the competitors, who, although they may be under the influence of illusions as respects themselves, are by no means bad judges as respects third parties who are competitors. With them come their adult friends; but over and above all these come teachers, tutors, professors—interested, no doubt, in the judgment upon their pupils—most capable of controlling and exercising a decisive control upon the judgments in relation to third parties. In France there are perhaps the only extensive trials of the principle of competitive examination which have been in operation for many years; and an examiner there assured me, as a common fact belonging to these examinations, that the security for integrity and strictness was complete. Indeed, the operation of the securities is felt to be so by the judges. One of them assured me that such was the effect of the interest brought to bear upon a full, open, and large competition, that if he—if any one, were disposed to be unjust, or were thoroughly corrupt, he dared not be so. He was stringently obliged to strive manifestly to be just. In relation to the 61 cases where nominated and close competition was admitted, it will have been observed that there were on the average nine—three appointed competitors for one place. The commissioners had appointments to make for the service of their own office. The appointments were of four clerks, three of them junior clerkships, with salaries of £100 per annum, rising by £10 per annum to £200 per annum; and a fourth, a senior clerkship with a salary of £200 per annum, rising by yearly instalments of £15 to £300 per annum. The commissioners attest their own respect for the public opinion in behalf of open competition by subjecting these four to it; that is to say, four out of four hundred for an open competition, if that can be said to be open in which there was, as stated by them, no public notification by advertisement, but only a mention to a few friends or persons connected with colleges whom they happened to meet. Yet, instead of only some three for each place, there were more than eleven, or 46 for the four. A vast deal of alarm has been affected and expressed that if admissions to the public offices were opened to public competition, there would be an immense rush of persons of low social position by which those offices would now be filled. Apparently to allay this apprehension, they are careful to state that of the 246 candidates, 26 were the sons of professional men and independent gentlemen. There were seven sons of clergymen, two sons of dissenting ministers, eight sons of gentlemen, two sons of magistrates of police courts, two sons of surgeons, two sons of lieutenants in the royal navy, one son of a colonial judge, one son of a professor in a university, one son of a commander of the coast guard, one son of a chief clerk in a government office, one son of a lieutenant-colonel. Others had been in different occupations—seven in mercantile houses, two in banks, three in Government offices, two in public companies, one in a public board. Twenty-five had finished their education at universities, sixteen had been educated at large public schools or well-known grammar schools, and five at private schools exclusively. The commissioners state, as the result of the open competition, that its advantages have not been confined to the successful candidates. [Mr. Chadwick, after referring to the small proportion of persons appointed to offices by competitive examination compared with those who obtained them by nomination, with the exception of the India civil and medical service, said]:—But the nominated and private competitions, if they be really so, to vacancies which are unknown, are closed to Ireland and the rest of the kingdom. There are 37,000 persons engaged in the civil service of the nation. What the annual vacancies are no member has been at the pains to ascertain for the public. Besides, there are, or were at the time of the census, 10,000 officers of the army, and 8,480 officers of the navy. Consider the influence of the junior appointments to the vacancies in such numbers on the education of the country, and of what is yet to be done for it. The chief aspects under which the facts may be legitimately presented to the consideration of the section are the economical, the social, and the educational. I revert to the facts I have mentioned, of the large proportion of rejections on mere pass examinations for commissions in the Indian army. From the declared rank of the parents of the candidates, as gentlemen and persons in good social position, I think there can be no reasonable doubt that the education of the whole of the candidates had been paid highly for by their parents. Sir Charles Trevelyan has been led to infer the cheapness of the education by the results; but although some of it might have been given in private schools, most of it would, I apprehend, have been of an expensive character. Yet the expense had been incurred in vain, the test of the mere pass examinations proved that in more than half the cases of rejection on a low standard of qualifications, there was almost a total wreck of the hopes of the family, and an irretrievable loss of the youth's time and the parent's money. Was this amount of loss, then, to be ascribed to the default of the educators? In some instances it probably might be so, and against such losses the competitive examination will form a new and important security for private persons as well as for the public service; but I apprehend that in a large proportion of instances certainly, and in most instances, it was probably not the fault of the educators. Impartial experience displays the fact that the frustration of the labours of competent instructors is occasioned by the perversion of the motives of the pupils by the patronage system, by holding out to them the promise of the fruits of labour to be given to them without any care or due assurance of the performance of any labour whatever. From examiners and also from professors engaged in the education of the very classes who are affected by the operation of the competitive system of examination for appointments in the East India Company's service, I have been informed, even under the very limited extent to which the change of system has been carried, it has been attended by social improvements of a very high order, conducive to the morals, the security, the prosperity, and the repose of families. The lecturer then narrated an instance of a wealthy proprietor of East India stock, who had a number of "fast" young men, his sons, for whom it was intended to procure, by his influence, appointments in India. The competitive system, however, was, in the meantime, introduced, and, being obliged to qualify themselves instead of depending upon patronage, they changed their course, and by steadiness and industry, and intellectual ability, they had legitimately entitled themselves to appointments. "He," says Sir James Stephen, "whose name shall stand at the head of the competitive list, will, I admit, possess these humbler virtues—*i.e.*, intelligence, and the steadiness of methodical men of business—because in youth good scholarship implies good character. But he will also be found to be a man of more than average self-possession, promptitude, address, resource, and courage. Such, at the least, are the characteristics of those who gain the highest places at our examinations at Cambridge." And such, I should be prepared to expect, would be the characteristics of those who gain the highest places from Ireland. But, observing this change, the fast young men of the merchant's family stay their career. Those who were distrait at their studies, who wearied and disgusted their tutors, are now becoming attentive and interested, and are found to have good natural capacities for studies for which they before declared they had no genius, and their tutors, who were bores, are becoming revered men. Time must be allowed to these victims of the patronage system to haste back and make up for past fastness, but there is fair promise of some of them becoming eventually successful competitors. As attention to study increases, disorder diminishes, and peace and confidence are gained by the change to the merchant's family. The system which ensures to the State a good and safe officer tends to insure, to the private family a good member and a sure support. To what did the merchant owe his own position but to open competition in an open profession? In basing the future of his house upon patronage, he based it upon a quicksand liable to be removed by every change of party. The beneficent elements described will be found to operate to the repose and security of the highest families as well as those of the middle classes. (Mr. Chadwick alluded to the benefits which competition would have in improving all classes of society, and read a testimony which he had received as to the working of the competitive system, through Dr. Kirkpatrick, from his assistant, Mr. Charles F. Patterson, of the Albert Training Institution, Glasnevin, from Mr. Robert Chambers, respecting the proportionately large number of able men that had come from Aberdeen, and the different effect which bursaries, to which persons in the college were nominated, produced in contrast to others which were obtained by competitive examination. He then gave an extract from the report of the Royal Commissioners on Education, at the head of which is the Earl of Aberdeen, condemning the system of patronage bursaries, and observed that there are still very many bursaries in several of the universities which are not awarded after competition, or upon any other principle. Some are bestowed, upon the application of individual professors, by the Court of Exchequer, in consequence of grants authorised by King William. He then proceeded to illustrate other effects of the competitive system, besides those already referred to, upon the general education of the country. He then referred to the good effects which the competitive examination would have upon collegiate and other educational institutions, and having adverted to the success which young men from Ireland had recently had in them over those from Scotland, and their beneficial tendency in France, and the benefits which would accrue from them in every department of public service and private business by the right direction which they would give to parents in the education of their children, and the great utility of certificates of qualification which examiners might give to those whom they considered competent to discharge the duties of the various offices for which they should become candidates, he thus continued) We have already had examples of the service of the public examinations to private professions. In the Government School of Mines, first originated under the direction of my friend the late Sir Henry Delabeche, the training of the pupils is tested by competitive examinations for certificates of competency. Under this stimulus their qualifications have been so well established, that hitherto all the pupils have obtained employment in the private service market. Although the commencing salaries offered were £150 per annum, more than double those of junior clerks, I am informed that none of the certified pupils have hitherto been got to accept them. Competitive examinations for certificates of competency are now proceeding with good promise of success in the Government Schools of Practical Art, under the superintendence of Mr. Henry Cole and Dr. Lyon Playfair. I learn that the results of the training of female school teachers, tested by examinations, have been similar to those of the competitive examinations of the males for certificates of competency, but in another direction, which I mention for the edification of the ladies present. The females have been so far advanced in mental power and influence as to have been lost to the service by matrimonial engagements, obtained with exceeding rapidity. I will only observe further, that the question, as I have been enabled to submit it to the section, relates solely to the principle of competitive examination. It is independent of the subject-matter of examination. In my own view, much of that adopted is objectionable, and it ought to be made far more practical. The question assumes the previous ascertainment of moral qualifications. It assumes also the possession of physical qualifications. In the debate on the important question of the application of the principle of open competition to admissions to commissions in the army, one of the old generals talked depreciatingly of the mental qualifications for clerk work, and gave an instance where an officer failed, when surrounded by enemies, and was put to it to exercise his bodily prowess—the "prowess" which belongs to the ranks. But that general should have been reminded that Bonaparte made military schools and open competitive examination the test of the mental qualifications for admissions to his army, and that he so advanced the intelligence of his officers as to bring up men of inferior physique, small men, like himself, to be more than a match for men of greater bodily power. As observed by Mr. Sidney Herbert, the bodily qualifications may be included in the competitive examinations too, and I have no doubt that the youth of Ireland, such as I see here at the University, would not be backward at the tasks he proposes, of showing how they could get over Leicestershire fences, or trying a fall, or taking up the foils. Sir Charles Trevelyan and myself, and, I believe, most other civil servants who have never advocated the open competitive examinations, have confined it to the junior appointments, and have assumed prolonged and careful probation of the application of the qualifications after appointment. The senior appointments to higher positions or of speciality will properly be of cases where the individual's professional career—as a lawyer, for example—will have been a prolonged competitive examination and probation. To parents, then, who are deeply interested in the success of that education which is to govern the destinies of their children, the cause of public competitive examination commends itself, as a means of insuring the domestic peace and the prosperity of their families, of influencing the minds of young persons, by the constant presentation of peculiarly impressive examples of success achieved by diligence, and of failure attendant upon idleness and dissipation; and it also commends itself to parents as a means of testing for their selection the merits of schools. To tutors and educators of every class and degree, the cause of open public competitive examinations for the public service, and collaterally for the private service, commends itself to their support, as a security against the perversion of the minds of their pupils, as a means of sustaining the pupils' interest, cheerful attention, and sympathies, and as an additional guarantee for the just appreciation of educational exertions. Politically speaking, it is no new doctrine, but old common law, as I might show from adjudged cases, in respect to offices, that the State has a right to the best service, and it follows that the means should be adopted by which the best service is ascertained and securely tested. [The author then referred to the unanimous expression of feeling in support of it at the great Educational Congress held in London, and presided over by Prince Albert, and to the efforts of the Society of Arts to get the principle acted upon. As an instance of the results of this, he mentioned that a bookseller's assistant at Leeds, who was found to have remarkable talents for mathematics, was now employed in recording observations most satisfactorily at the observatory at Kew. He also stated that he had in his possession a letter of acknowledgment to Dr. Kirkpatrick, of the agricultural school, Glasnevin, from a young man, the son of a poor carpenter, in a remote part of Ireland, who, after a severe examination, has obtained a civil service appointment for India. He submitted, in conclusion, that it was due to the Association that it should take some practical steps on this question, and he commended it to the earnest independent support of the intelligence of the country.]

The President of the Section (the Archbishop of Dublin) said he would relate two anecdotes to the meeting, in confirmation of some things that had been referred to in the interesting paper which they had just heard read. The first was connected with the University of Oxford, and confirmed the statement made by Mr. Chadwick of the great evil which was produced by men finding that the way to honour and emolument was easy to them, without any exertion on their part. In the University of Oxford, previous to the recent reforms, there was a secure position on a particular foundation for any who could prove that they were of the kin of the founder, which led to the saying that such a person was almost a founder, meaning by this expression that he was a blockhead or dunce, and in the school from which these young persons came, they were generally called by the name of dunce. Another anecdote which he would state related to the establishment of the Professorship of Political Economy in Dublin University. There were questions prepared and sealed answers required from the candidates, and out of those which the founder of the chair had received, he selected three papers, stating that any one of the writers was quite competent for the professorship. This system of competitive examination had been followed ever since that time, and the University of Dublin had now one of the best schools of political economy in Europe.

COTTON CULTIVATION AT PORT NATAL.

The following letter has been addressed to the Council of the Cotton Supply Association:—

"Gentlemen,—Having observed with interest an account of some of your late proceedings relative to the supply of cotton for this country, and being, as I believe, possessed of some information on the subject, particularly as to the reason we have so small a supply from our own colonies, when in fact, some of them are much more calculated for its growth than America, I will at once proceed to offer a few remarks on the subject, particularly with regard to its cultivation in the colony of Port Natal, in which place I resided for nearly three years. My object in going there was for the sole purpose of cultivating the cotton plant, but which, for several reasons, I never attempted, being fully persuaded, shortly after my arrival there, that the attempt would not only prove a failure, but would involve me in ultimate ruin.

"I will, in the first place, state the reason why the plant has not hitherto been grown in the colony; secondly, why it never will be, unless a different system be adopted; and, lastly, the system I would recommend to secure its beginning and ultimate growth to a large amount.

"As I have before stated, about nine years ago, I proceeded to Port Natal, for the purpose of cultivating the cotton plant, and with the full expectation of finding many others engaged in the same business. For this I took with me all the requisite implements, &c., necessary for a cotton planter; and upon arriving at our destination (for there were four in our party), we, of course, before proceeding to business, felt anxious to see the cotton plantations already at work in the colony. We inspected a few of the most extensive, viz., Messrs. Milner's, Wilson's, and Dunn's—these, indeed, being about the only persons who had as yet attempted its cultivation, and these, also, being three of the largest landowners in the colony, for neither of them possessed less than 6,000 acres, out of which they had each from three to five acres planted with cotton, which seemed to grow almost spontaneously, or with little cultivation. Upon inquiry, however, I found they had no intention of extending their plantations beyond the present size; their object evidently being not to grow cotton, but to sell their land to purchasers at a good price—keeping up these small plantations, in order to show what the land would do, provided anyone chose to become a planter; this, of course, was all very well for them, but rather unsatisfactory for us, and we consequently resolved not to cultivate any cotton except, perhaps, a few acres, until we understood why others (for there was not one real cotton planter in the colony) did not cultivate it. We, nevertheless, purchased land in a good cotton district, and planted cotton seeds in our gardens. The plants grew to perfection, and produced Sea Island cotton nearly three inches long in staple, and in quality almost like silk, and without any attention after the seed first having been planted; for the plant in that colony will not last many years. This is a point worthy of notice, and, in this respect, Natal possesses a great advantage over America, where the cotton plant is an annual. I, however, soon discovered that to depend upon the natives for a constant supply of labour was out of the question, as sometimes we could have engaged as many natives as we required, whereas at other times we were even under the necessity of cooking our own meals, as not one single Kaffir could be got to work.

"The uncertainty of labour is traceable to the fact that a Kaffir man has no occasion to work, as his wives not only keep him, but produce also immense quantities of Indian corn, which they sell to the white people for cattle, money, or goods; indeed, while the women work in their own corn-fields from sunrise to sunset, the men stalk about the country enjoying themselves, or perhaps working for a month or so now and then to obtain a little spending money. The women are not allowed by their husbands to work for any one but themselves, therefore the uncertainty of Kaffir labour is the one great reason why cotton cultivation does not progress in South Africa; but there are others, viz., the many other occupations which can be followed by the colonists with more profit and less risk—as, for instance, trading with the natives for their produce (Indian corn), in which I myself and numbers of others were engaged, sending out our waggons for miles round the country, where we could purchase the corn at the rate of one shilling per sciple (a measure of about 60lb.), and, after bringing it to the port for shipment to the Cape of Good Hope, we could get three times as much. I have made by this trade alone from £5 to £6 per week for six months in the year. Then there is trading with the Dutch Boers up in the interior; in this many are engaged. There is also a trade carried on with the Zooloo Kaffirs for cattle and ivory. Another occupation is the shooting of elephants for ivory. These occupations, and many others of a similar nature, fully occupy the attention of the colonists, and pay them much better than cotton planting, or, indeed, than farming in any way could possibly do; consequently the Kaffir women are, and always will be, the only farmers in the country of any consequence, for wheat will not grow at Natal, therefore this great article of consumption by the colonists has to be imported from the Cape. Potatoes are grown by the Kaffirs and sold by them to the whites at a very cheap rate; in fact, I can truly say, during the time I was in the colony that, with the exception of an acre or two of cotton, an acre or two of sugar cane, and a few tropical fruits, oats, for the use of horses in the colony, were the only produce of the farmers. Large quantities of cattle were, however, raised for shipment to the Mauritius.

"The principal exports from the colony are cattle, ivory, and Indian corn. Therefore, unless a planter can depend upon black labour, it would be folly to attempt the cultivation of the cotton plant, as white labour would be out of the question for such a purpose; and in the face of this objection, and while there are other occupations which may be followed with greater profit and less risk, who is there left to plant cotton? Not one.

"I conclude, therefore, after mature consideration, that, so long as the above objections remain, the planting of cotton in South Africa will ever be a decided failure, and that, unless a different system be adopted, little or no cotton from that country will ever reach England, and when we consider the suitableness of the climate for the production of this much-required article, we cannot but regret that the only proper mode to encourage its growth has never yet been adopted, viz., that of the Kaffirs growing it on their own account (of which I will speak hereafter), and until this be done, the cotton-spinners of Manchester must still look to America and the East Indies for their supply, at least so far as South Africa is concerned.

"I will, therefore, now state how the Kaffirs are to be induced to grow cotton on their own account, and the system which, if pursued, cannot fail to produce the desired effect.

"I have before stated that the Kaffir women labour in their corn-fields from sunrise to sunset. They do not do this merely for a subsistence, as almost every Kaffir family produces three times as much Indian corn (which constitutes their chief food) as they require for themselves, therefore, two-thirds of the quantity grown is sold to the colonists, who, in their turn, sell it to the storekeepers, and it is shipped by them to the Cape of Good Hope, as food for pigs, horses, &c., and, from my own observation, the quantity in value sold by the Kaffirs to the whites does not amount to above 30s. per annum for each woman or wife. I am well able to judge of this, having made exclusive bargains with different families of Kaffirs to purchase all the corn they produced for sale in one season, and, consequently, I arrive at the above estimation from a general average. Now, when we consider that the Kaffir woman, who seems born never to be idle, labours in the field for eight or nine months in the year for the value of 30s., we can but exclaim, 'What a pity it is their labour is not turned to a better account than growing food for pigs and horses at Cape Town, and from which they themselves reap so small a profit.'

"The question then arises, why do not the Kaffirs produce cotton, which would realise them ten times the amount of remuneration for their services?

"In answer to this I will give their own reply, for I have several times asked them the question. Their answer invariably is, 'Kaffirs don't understand cotton; Kaffirs never did grow cotton; all Kaffirs grow corn, and don't want to grow anything else.' This is at the same time accompanied by a laugh, as if the very idea of Kaffirs growing anything else but Indian corn was quite absurd, though, at the same time, they know very well what a cotton sheet is, and know how to appreciate it when they lie down to sleep at night.

"Perhaps if cotton were grown by the colonists, the Kaffirs would take up the business on their own account, but as this opportunity is lost to them, of course there is no encouragement for them to begin. Nevertheless, it is pretty certain if they could be induced to begin, they would find it so much more profitable than growing Indian corn, that they would give their whole energies to it, and in a short time the country would be covered with Kaffir cotton fields, instead of, as they are at present, with Kaffir corn fields, the produce of which the white people would purchase from them, and in their turn sell it to the merchants at the port for shipment to England; and, as the Kaffirs are a people fond of trade, and of acquiring riches, they would improve daily as a body, and doubtless, in time, form the main support of the colony, instead of, as they are at present, doing little good to themselves and less to the colonists.

"The question, therefore, next arises how must this beginning be effected, for as the Kaffirs do not seem to comprehend the idea of growing cotton for their own profit—though I am not aware of their ever having been asked by any person besides myself—how can they be taught? My reply is, teach them in the same way the Welch people, in days gone by, were taught how to kill wolves, by having their taxes to pay to the English government in wolves' heads, so that by these means the wolves were all destroyed in the country; in the same manner, then, let the Kaffirs pay their tax in cotton; but, as you are not likely in Manchester to know anything about the Kaffir-tax, I will endeavour to explain it.

"This tax is a sort of poll-tax paid by the Kaffirs to the colonial government of 7s. per annum for each wife, so that a Kaffir having six wives has 42s. per annum to pay to the government; now this sum paid in cotton, say at 2d. per lb., would be 252 lbs. I cannot just now estimate the number of Kaffirs there are in the colony, but as their numbers are very great the quantity of cotton thus grown must be considerable; and, when we consider the quantity which would afterwards be grown over and above that required for the tax, the quantity would in course of time become immense, for the natives would soon perceive that cotton paid them much better than corn, and, having once discovered so easy a method of acquiring riches, they would, in all probability, in course of time, become systematic planters, and the colonists would be the purchasers or medium between the grower and the consumer.

"The tax is at present collected yearly by Kaffir magistrates, who reside in different districts, and are under the direction of Mr. Shepstone, the superintendent of Kaffir affairs, therefore, with the combined assistance of Mr. Shepstone, the Kaffir magistrates, and a party at the port of D'Urban to manage the shipping of the cotton to England, and the distributing of cotton seed and gins to the magistrates, the entire business could be arranged; the only difficulty to be got over would be whether the colonial government would ship the cotton to England on their own account (which is doubtful), or whether it would not be requisite to purchase it from the colonial government on behalf of some Manchester house or company; but in either case the object is attained—the cotton is grown, and the Kaffirs would continue to grow it so long as there was anyone to purchase. It may be objected that the Kaffirs have not the ploughs and other necessary implements; but I will give a short description of their mode of planting corn, and then you will perceive the practicability of their planting cotton. In the first place, a Kaffir woman has fixed upon a spot for planting corn; if it be covered with trees and bush, she gets her husband to cut down the trees and clear away the bush. When this is done she goes over with her pick (an instrument similar to a joiner's adze) and clears off the grass and burns it. She then goes over it a second time and cuts up the earth with the same instrument, at the same time planting the seed. Nothing is afterwards needful to produce a good crop except going through it two or three times while growing, to clear away the weeds.

"In this system of agriculture the Kaffirs possess a great advantage over the colonists, inasmuch as the trees being small and close together, it is impossible to get a plough along without taking out the tree stumps or roots, which involves great expense, notwithstanding the low wages paid to Kaffir men by the colonists—viz., 5s. per month. The cost of clearing bush land in Natal is not less than £6 per acre, whereas merely cutting down the trees and leaving the stumps in the ground will not cost 10s. per acre. This is also another serious objection to farming on scientific principles in this colony. By the Kaffir system, however, the earth, after having been well picked up—say five or six inches deep—would answer every purpose for cotton planting, and the plant, when grown, would last several years. It must be borne in mind that the low lands, which are without bush, are not calculated for growing cotton.

"These, therefore, are the reasons why cotton is not grown at Port Natal, and at all other colonies similarly situated.

"Blacks grow it in America; blacks grow it in India; and blacks must grow it wherever it is grown, as no white man could work at it under a broiling hot sun; nor could he compete with the black man in point of cheapness of labour.

"I have, during my residence at Natal, paid some attention to the subject, and, from my knowledge of the Kaffirs, can form a pretty good estimate of their dispositions and character: and what I have to say is, that once get them into the way of growing cotton, and they will continue to grow it, and doubtless in time astonish the world by their productions; and when we remember that most of them have fled from their own countries to seek protection under the British government, it is not to be wondered at that they readily and willingly pay the tax imposed upon them, and would as readily and willingly pay it in cotton if they were required to do so.

"Dr. Livingston's researches in Central South Africa have attracted my attention to it as a cotton growing country, and I have no doubt that cotton might be grown there by the natives and purchased from them by an agent, but the difficulty of bringing the cotton down the Zambesi river would, I fear, as yet prove an insurmountable obstacle, inasmuch as the Zambesi river has many obstructions in it, such as waterfalls, rapids, &c. These, though capable of improvement, would take a large capital (at least I speak only from the slight knowledge I have obtained from a pamphlet published on the subject), but, nevertheless, I should not object to proceed even there for such a purpose, though I could not recommend it in the present state of the Zambesi river, and while Port Natal is in every way calculated to produce cotton to so great an extent. Nevertheless, if Dr. Livingston should establish a missionary station on the Zambesi (which I believe he is about to do), I would not object to proceed there, and, with the assistance of Dr. Livingston, induce the natives to grow cotton, should such an undertaking be thought advisable.

"I am, gentlemen, your obedient servant,

"ALFRED SOUTHAM.

"9, St. James's square, Manchester."

The following letter upon the same subject has been addressed to the Editor of the *Daily News*:—

Sir,—I beg to submit the following to your consideration, hoping to banish from you misgivings that appear to have been unnecessarily excited.

You have, in your leader of the 11th inst., noticed a letter from Mr. Southam, about the growth of cotton at Natal, and taken a discouraging view of the chances of getting cotton thence. May I be allowed to point out to you why I derive exactly the contrary conclusion from that letter? In order to do so I must first allude to a few points in that communication that appear to me to deserve notice. First, I think that a party who leaves this country with a mistaken impression—viz., that of finding many others engaged in the cultivation of cotton, and who, on his arrival, observing his mistake, immediately abandons the object for which he started—is not a party well adapted for the purpose of introducing the growth of a new article in any colony.

I should next like to know, with what amount of capital Mr. Southam intended to make the attempt to execute his purpose, if the attempt alone would involve him in ultimate ruin. The individuals Mr. Southam names as the largest landowners are certainly not such. Mr. Archibald and many others possess considerably more than 6,000 acres of land. My impression is that Natal, in due time, will contribute very largely to the production of cotton. The passage in Mr. Southam's letter which particularly favours this view, is that in which he states that he planted cotton seeds in his garden which grew to perfection, and produced Sea Island cotton nearly 3 inches long in staple, in quality almost like silk, without any attention afterwards, the seed having first been planted, for the plant in that colony will last many years; and in this respect Natal possesses great advantages over America, where the cotton plant is an annual. The conclusion at which Mr. Southam arrives is also encouraging, viz., "that the growth of cotton once introduced at Natal, it will continue to be grown, and doubtless, in time the Natal people will astonish the world with their productions." He states "blacks grow it in America, blacks grow it in India;" true, but also in those countries it is grown most by blacks under the superintendence of white men, and so it will have to be at Natal. Why should the Zambesi River be used for the export of cotton grown in Natal, when the Tugela is the proper river for it? and it would be most judicious to ascertain the capability of this river, being in our own colony, before exploring that of the Zambesi, which is in a Portuguese territory. I was particularly pleased at your sound views in condemnation of the plan of forcing the Kaffirs to pay the taxes in cotton. This would never have the desired effect. Government need not turn traders: there are plenty of merchants that will buy and export cotton grown. Mr. Southam speaks of nine and six years ago, but since then the colony has undergone great changes, and continues to advance with vigorous strides. A considerable number of Yorkshiremen have purchased large farms and tracts of land there, and are cultivating it and reaping the benefit of their labour. The missionaries have done much to improve such Kaffirs as are in their localities. The Hanoverian missionaries at Hermannsburg, Natal, have already formed six stations; they employ Kaffir labour to their full satisfaction, and find the tribes peaceable, industrious, intelligent, and willing; it is a pleasure to watch their progress—they have built a church and schools. My impression is that Mr. Southam has not been far into Natal. I have two farms at Natal, each above 7,000 acres. The neighbouring farms are also held by Yorkshiremen. My tenant is so well satisfied with the locality, products, traffic, labour, climate, and everything, after a residence of six years, that his parents and the whole family have now left England to join him. The farms abound in coals, stone, and iron ore. I am quite prepared to assert that the colony, in the course of time, will be very valuable, and form one of the best of our colonial possessions. How soon this will be brought about, or how long retarded, depends totally upon the support the colony receives. Out of nothing, nothing can come; but the foundation for it, nature has laid in her plenitude of bounty. The movement now going on amongst the Zulu tribes should certainly be made use of to extend the blessings of civilisation also amongst these uncultivated tribes. Mr. Southam comes to another conclusion, which I beg to contest, that is that the Kaffir women are, and always will be, the only farm labourers in the country of any consequence; for, there is no doubt, the more a country becomes civilised, the more the hard labour of women is abandoned, and with every step of the colony in advance, the field labour of women will be diminished.

Fearing that I have already too long trespassed upon your columns, I will leave the subject for the present, and I remain yours, &c., HENRY LUDOLF.

Leeds, Sept. 16, 1857.

COMMERCIAL PRODUCTS OF AFRICA.

At a meeting held in the City Hall, Glasgow, on the 16th inst., on the occasion of the presentation of the freedom of that city to Dr. Livingston, that gentleman afforded some further information in reference to this subject. When he addressed the meeting at Manchester he omitted to mention among the products of the country the wild grape vine, of which there were three varieties, none of them at all good to eat in their uncultivated state, but capable of great improvement. He was informed that the Angora goat was also found there. The long silky wool of the animal gave it the appearance of walking without feet. Cotton was cultivated more or less all over the country. A single merchant of Manchester, Mr. Clegg, about 11 years ago began to distribute cotton seeds among the missionaries, and about seven years ago he began at a loss to purchase cotton. But this year he obtained about 600 bales of cotton, and next year he expects to get at least 1,000 bales. He sent out cotton gins to the natives, who were delighted to get them; and he (Dr. Livingston) thought if the same process were carried on by the Cotton Associations of Glasgow and Manchester, in the course of several years it would have a material and most beneficial influence on the market, and he hoped that it would relieve the American slaveholders from the necessity of having slaves. At present they produced cotton merely to supply their wants, and they had no artificial wants. Commerce showed us that we were dependent upon others; but with the heathen there was no such thing. They liked to be independent of everybody else, and to depress others. He believed that the restriction upon trade in our own country was but a remnant of heathenism, but it had now been happily removed. At present the forming of companies for African trade would be premature, and the thing must be begun in a small way. The Portuguese were on the outskirts of the country on both sides, and he thought it would only end in good feeling if we consulted with them, and invited their co-operation. There could be no doubt that they would derive the greatest benefit by the extension of commerce with Africa; but they had been for ages on the outskirts, and unable to develope the resources of the interior.

In the evening another meeting took place, the Lord Provost in the chair, when Dr. Livingston was presented with a pecuniary testimonial, amounting to £2,000—the result of a subscription raised by the citizens of Glasgow.

ROMAINE'S STEAM CULTIVATOR.

A trial of this machine took place on Friday, the 11th instant, in a field near Crosskill's Agricultural Implement Works, Beverley. It differs from all others hitherto brought before the public for the purpose of applying steam power to the cultivation of the soil, in entirely dispensing with the use of ploughs, ropes, or auxiliary implements. It is a 14-horse portable steam-engine, capable of propelling itself, combined with, and giving motion to, a rotary digger, which is said to pulverize the land completely to any required depth. The engine and boiler are constructed in a similar manner to the portable agricultural engines now in common use, and are carried by a pair of high broad wheels, and by two smaller wheels in front. The large wheels are driven round by the engine, and the front wheels used for steering, but by a simple disengaging arrangement, the latter are left perfectly free when the machine has to be turned round, and by driving one of the large wheels while the other remains stationary, the implement can be turned completely round in its own length. The cultivating part of the machine is carried by a strong frame attached to the boiler, and consists of a hollow cylinder 6 ft. 6 in. long, and 2 ft. 6 in. in diameter, armed with knives or cutters on its outer surface. The cutters are of wrought iron, and sufficiently strong to enter the land, and encounter roots, stones, or other obstacles without injury, but in case of accident they can be readily replaced at small cost, and without delay, as each is secured separately by bolts to the outside of the cylinder.

The machine is the invention of Mr. Robert Romaine, a Canadian, and was shown at Paris at the great exhibition of 1855. It there attracted the attention of Mr. Crosskill, who induced the inventor to bring it to Beverley, and during the last two years two machines have been constructed at the Beverley Iron Works, and experiments carried out for the purpose of fully developing the principles of the invention and perfecting the details of the machinery.

The implement commenced operations at one end of a field of strong clay stubble, and traversed its entire length, transforming a breadth of 6½ feet into a perfect seed-bed, equal, it is said, to what could have been produced by twice ploughing and harrowing, or clod-crushing. On its arrival at the headland, it turned round in less space than would have been required by two horses with a common plough, and returned along the side of the work already done. The cultivation of the field was thus proceeded with, no vacant space being left except the two small headlands, which could easily be finished by the machine after the rest of the ground was done.

The machine is said to be capable of cultivating from five to seven acres per day, at an expense (including engine-driver and assistant, coals, man with horse and cart to fetch water, and wear and tear of machine) not exceeding 35s. to 40s. per day.

THE LIQUID MANURE QUESTION.

The following is extracted from *Bell's Weekly Messenger*:—

Monsieur Barral, the editor of the "Journal d'Agriculture Pratique," during his recent agricultural tour in England and Scotland, examined all the facts and collected all the evidence within his reach, bearing on the value of liquid and sewage manure. In the number of his "Journal" for the 20th August, he commences what he terms "A sort of preface to a series of articles, to be devoted to the consideration of the value of liquid manure." After stating that he found that English farmers, landowners, and engineers had very little faith in the statements contained in the reports of the "Board of Health," and that they were almost all agreed "that liquid manure could only be applied profitably by gravitation," he proceeds to describe the well-known system of irrigation by subterranean iron tubes, through which liquid manure, driven by steam power, is applied in showers by hose and jet, and to observe that "The ill-repute of the 'Board of Health' in England has especially arisen from the heavy expenses which it has imposed upon towns for the express purpose of applying their sewage to agricultural purposes, the result having rarely (never) answered the promises made by Mr. Chadwick, and that the ruin of Mr. Kennedy, of the liquid manure farm, Myer Mill, Ayrshire, has produced a very unfavourable opinion of the liquid manure system among farmers." At Myer Mill, pipes were laid over 400 acres, but guano and other manures were applied in addition to the liquid. "At any rate, after Mr. James Kennedy retired, another farmer took the Myer Mill Farm, and up to the present time he has not made use of the liquid manure machinery left behind by his predecessor. Farmers in the neighbourhood considered that the new farmer might perhaps use the hose and jet system profitably (for certain crops) now that there was no rent to pay for the costly machinery." "Another apostle of English agricultural novelties, Mr. Mechi, who has advocated reducing all manures to a liquid state, has just retired in solemn form from the discussion, stating that he wished for the future to live in peace and tranquillity. It is natural, if not correct, to conclude that the results obtained by the agriculturists are not equal to those of the City tradesman and sheriff of the City of London. Tiptree Hall is closed to visitors; the shop of the vendor of needles, razors, and dressing cases remains open! We must confess," M. Barral continues, "that what the most puts us on our guard against the reports of the Board of Health are the omissions and serious mistakes we find in them. When we visited the liquid manure farms, described in official reports, and compared what we actually saw with what had been reported, we were very much surprised to find that virtues and effects had been attributed to liquid manure to which it had no claim. We will give a striking example, by translating from a report of the Board of Health, dated December 31, 1851, the account of Mr. Telfer's liquid manure farm, of Cumming Park, near Ayr."

Mons. Barral then translates literally the well-known description which has done duty in support of Mr. Chadwick's liquid sewage theories so many times, and last in Mr. Dimond's prize essay on liquid manure, in the last number of the "Bath and West of England Agricultural Journal," a very clever essay, but so carelessly compiled, that Mr. Dimond treats the ruined farm of Myer Mill as still in full successful working, and takes the account of Mr. Telfer's for truth.

Mons. Barral continues:—"It is evident that from this official report Mons. Mole, in 1852, and Dr. Harstein, in 1855, borrowed their account of Cumming Park. We will now compare the official report with a literal account of our visit to that place on the 7th August, 1857, in company with M. de Guaita. This account (*procès verbal*) was drawn up the evening of our visit, from the notes of our conversation with Mr. Telfer, that eminent agriculturist having, in the most obliging manner, given us all the details of his very curious undertaking."

"Cumming Park Farm is situated about a mile from Ayr, and contains about 50 English acres, of which half can be irrigated by subterranean pipes. The soil is entirely composed of siliceous sand of great depth; and is, in fact, a sort of sieve upon which vegetation can only become luxuriant by means of an abundant supply of manure. The surface is slightly undulating, and the house and farm buildings are placed upon two ridges a little above the rest of the land. We saw fine crops of wheat, potatoes, very fine Swedes and mangold, and a magnificent growth of Italian rye-grass. The farm is cultivated on the four-course system. The dairy is supplied by 48 cows of the Ayrshire breed. The steam-engine is of 12-horse power. The stock are fed on cooked food. In the yard are two large tanks, into which all the liquid manure falls on one side, and water, raised by a force pump, on the other. The liquid is well mixed. No solid manure is ever put into the tanks. The liquid is allowed to stand and settle before being used. The liquid, which is very much diluted with water, is pumped from the cisterns into the pipes by the steam-engine.

"The irrigation is applied immediately after a dressing of guano, which, for Italian ryegrass, is at the rate of *four cwt. to an acre* (500 kilos. to the hectare). They manure after every cutting. The Italian ryegrass, sown in autumn, furnishes five cuttings; an average cutting yields from 15 to 16 tons per acre. Mr. Telfer has obtained 64 tons of ryegrass from an acre (in the course of the year). Mr. Telfer told us that he had obtained as much as 80 bushels of wheat per English acre (query, Scotch acre).

"The liquid manure is only used to wash in the guano. Mr. Telfer considers that its fertilising powers were very slight. He observed, "It is only a vehicle for the guano; what there is does no harm, but it is quite insignificant."

We omit Mons. Barral's description of the dairy process, and proceed to translate literally his summary of the result of his examinations:—

"There are many important differences between the official report and Mr. Telfer's own account of his farm.

"1. The subterranean irrigation system is only applied to half the farm; consequently the cost per acre is just double what the Board of Health report states.

"2. No account is taken in the official report of the enormous application of guano, at the rate of eight and even 16 cwt. per acre. Thus the estimated profits must be reduced by the cost of the guano, about £480 per annum.

"It seems, then, that the Board of Health reports have given as an example of the wonderful results of the tubular system of applying liquid manure, an instance which only proves what enormous crops may be raised by the skilful application of vast doses of guano.

"We are, therefore, justified in looking with the greatest suspicion on all the documents issued by the first Board of Health; reliance on these documents having led our distinguished contributor, Mons. Mole, to most erroneous conclusions.

"A report made to the new Board of Health by Mr. Austin, without exposing the errors of the previous Board, gives a truthful statement, and suggests a system very different from Mr. Chadwick's tubular system."

In conclusion, M. Barral observes, "that to suppose that it was possible to make the soil return crops of such extraordinary abundance (as those described in Blue Book Reports), with no other stimulant than the dejections of cattle tied up and fed on the produce of the farm, is to put faith in an idea as absurd as that of perpetual motion. It was, in fact, an attempt to produce a great deal with nothing!"

This exposure, by a distinguished scientific foreigner, of the worthlessness of one of Mr. Chadwick's many attempts to force down the throats of the farmers of England his theory of "agricultural perpetual motion" is very timely. In the course of a few weeks a great meeting will be held at Birmingham, Lord Brougham in the chair, when, should Mr. Chadwick, under pretence of discussing sanitary questions, repeat his stock of stories about Cumming Park, Rugby, and Myer Mill, Mons. Barral's paper will afford materials for some puzzling questions. The questioner may also ask how it is that in the fifteen years that have seen the virtues of thorough deep-drainage, guano, superphosphate of lime, the value of the steam-driven thrashing machine, the clod-crusher, the iron-wheeled plough, the drill, the horse-hoe, and reaping-machine triumphant over the prejudices of the farmer, the liquid manure theory, supported by official authority, preached by officials, advertised at public expense in thousands of Blue Books, backed up by great lords, and tried again and again at vast expense, stands just where it did when Mr. Smith, of Deanston, propounded the plan, and invented the arrangement of jet and hose for artificial rain?

FRENCH INVENTIONS.

The prizes awarded this year by the Société d'Encouragement pour l'Industrie Nationale, for inventions and improvements in manufactures have just been published. Gold medals were awarded: To M. J. Dubosc, for having executed the first portable stereoscope, thus rendering the use of that instrument extremely easy. Stereoscopes are now sold in France to the amount of several millions of francs. To M. Guérin, the inventor of a system of self-acting breaks for railway trains. When the stoker has shut off the steam and taken the usual precautions for stopping the train, the effect is, that the nearer the carriages are to the tender, the closer they approach each other, so that, while the last and fore-last vehicles of the train are still apart, the buffers of the first and second have already met, and their shafts are driven further in than those of the third, fourth, &c. This circumstance has been turned to account by M. Guérin, for the buffers act upon his break while they are being driven in, and the break resumes its former position as soon as the train has stopped, in consequence of the gradual action of the springs of the buffers. These breaks are now extensively used on the Orleans Railway. To M. I. Pierre, Professor of Chemistry at Caen, for his researches into the efficacy of marine manures. To M. Fritz-Sollier, a manufacturer of India-rubber articles, for having re-discovered a method (previously found, but neglected, by MM. Sace and Jonas in 1846) for transforming linseed oil into a substance resembling caoutchouc, by treating it with nitric acid. This new compound is now applied for making waterproof stuffs, saddlery, &c. To MM. Gérard and Aubert for a process by which caoutchouc may, without undergoing a previous dissolution, be rolled out into thin leaves, threads, or pipes. They also are the inventors of the alcalisation of that substance, a process which renders it less brittle and much stronger than vulcanised caoutchouc. To MM. Perreaux and Clair; to the former for his India-rubber valves and other improvements in instrument making; and to the latter for a new kind of dynamometer. Medals of platinum were given to M. Derrien, for his manufacture of artificial manure of invariable fertilising power; and to M. E. Muller, for a work on agricultural and workmen's habitations. Silver medals were awarded to Mr. Stanley, for the manufacture of articles in basalt and lava; to M. Dumesnil, for an improved plaster kiln; to M. Gaudonnet, for improvements in pianofortes; to M. Tripon, for a process of aquatint washing on stone, imitating Indian ink drawings; to MM. Carmoy and Colas, for gilt nails and a machine for making them; to Dr. Benet, for a contrivance for washing foul linen by pressure; to Dr. Guyot, for a loom for weaving, at a very trifling cost, straws mats for gardening purposes; and to M. Klein, for a plan for retailing good and nutritious food to the poor in portions of the value of five centimes each. Bronze medals were awarded: to M. de Luca, for an improvement in blow-pipes, producing an uninterrupted stream of air by means of a hollow ball of India rubber acting as a reservoir; to M. Troccon, for an improvement in the lamps called moderators; to MM. Lacassagne and Thiers, for a regulator applicable to the electric light; to M. Bruno, for a writing apparatus for blind people, consisting in a steel point, producing letters in relief on a kind of paper used for counterdrawing; to M. Masse, of Tours, a blind man, for a curious and ingenious contrivance, by which those who, like him, have had the misfortune to lose their eyesight, may express their ideas on paper by means of printing types; to M. Colard Vienot, for an apparatus enabling the blind to write music; to M. Devisme, the well-known gunsmith, for an improvement in revolvers, by applying to them the principle of the Minié rifle; to M. Vitard, a carpenter, for an instrument by which the cubic contents of timber or trees may be ascertained off-hand; to J. Pouillen, for a bed of a peculiar contrivance for patients; to M. Heilbronn, for a process by which zinc may receive a coating of paint as durable as that which may be given to sheet-iron; to M. More, for a flexible globe for the study of geography, admitting of its being folded up like an umbrella; to MM. Lenz and Houdard, for a system of pedals and counter-pedals in pianos, by which the highest notes may be simultaneously combined with the lowest; and lastly, to M. Tiget, for an economical process of baking bricks.

LIGHTING MINES BY GAS.

Mr. Fryar, of the School of Mines, Bristol, has addressed the following communication, dated from Penzance, to the editor of the *Bristol Mirror*:—

"SIR,—The lighting of metalliferous mines is, perhaps, a subject of greater importance than most people are willing to admit. It is not only so in a financial point of view, but what is of greater importance, in a sanitary one. It appears that a light by gas will continue to burn about three times as long in the same quantity of air as a candle with about equal-sized flame, and that a gas light of ordinary size is sufficient to light a pitch worked by four men and two boys; in other words, in this case, one light by gas is equivalent to six lights by candle. According to this there will only be about one-ninth or one-tenth the quantity of carbonic acid gas given off by gas light of what would be made by six candles, assuming the flame of two candles to be about equal to one flame by gas. Light, whether natural or artificial, operates very considerably on the animal spirits. The workman feels much more animated and cheerful in working by the light of the brilliant olefiant, than he does when having to ply the pick or mallet by the dim light of a dirty candle. This feeling of cheerfulness is not only conducive to health, but is calculated to inspire the miner with energy, and enable him to do a greater amount of work in a given time than he could otherwise do. After the first cost of apparatus, fittings, &c., it appears that the cost of lighting by gas is only equal to about half of that by candle. The gas at the Balleswidden mine, near the Land's End, is carried down to the 110 fathoms level by a pressure at the surface of about 7 lbs. per square inch, the lights in the shaft, which is sunk on the lode, burn with a steady clear flame, exposing all the pumping gear and ladder fittings for many fathoms at one view. In the levels the same steadiness and brightness of light are almost equally serviceable, and in the ends and pitches, with the india-rubber tubing, which is lined with wire coil, the light can be moved about, or stuck up in clay, with almost as much facility and convenience as a candle. I am happy to hear that Mr. Wright is also giving attention to lighting coal mines by gas. I am persuaded that such may be done, although the cost of fittings in a coal mine will be greater than that in a metalliferous mine, because of the greater quantity of material worked away, and the consequent numerous changes that must constantly be made. On the other hand, the cost of coal for gas making will not be so much. I am afraid that fire damp mines will offer considerable difficulty to lighting by gas."

VITALITY OF SEEDS.

It has long been a disputed question among botanists, whether the uniformity existing in the vegetation of different islands and continents having no other communication with each other but a wide expanse of ocean is owing to a special creation in each instance, or to an interchange of seeds transported from one shore to another by the waters of the sea. M. Ch. Martens, professor at Montpellier, in a letter to M. Flourens, recently communicated to the Academy of Sciences, gives an account of certain experiments he has instituted for the purpose of ascertaining—1, whether many kinds of seeds are specifically lighter than sea-water, so as to swim on the surface; and, 2, whether, after having undergone the action of sea-water for a certain length of time, they are still in a condition to germinate. With regard to the first question, M. Martens has found that out of a certain number of different kinds of fresh seeds, chiefly of a large size taken at random, two-thirds will swim on the waters of the Mediterranean, the density of which is 1·0258. To ascertain the second question, M. Martens caused a large box of sheet iron to be made, divided into 100 compartments. Ninety-eight of these compartments received a certain number of seeds of different kinds, and the apparatus thus prepared was fastened to a buoy. A large number of minute holes pierced in the sides of the box allowed the water free ingress and egress, without any danger of the seeds being washed away. After a lapse of six weeks the box was taken out of the sea and opened, when out of the 98 kinds of seeds 41 were found completely rotten. The remaining 57 kinds were immediately sown in pots filled with earth taken from a heath. Of these, 35 kinds only germinated, including 17 of those which are specifically heavier than sea water, and could not therefore be transported to any distance; so that, out of 98 species, 18 only might germinate after a six weeks' voyage, under the most favourable circumstances. Repeating the experiment with the 35 kinds which had resisted the action of sea water for this space of time, M. Martens left them for three months exposed to its action, and then found 11 in a rotten state; of the other 23 only nine germinated, two of which were specifically heavier than sea water; so that, after three months' sojourn in the sea, a period most likely to be the usual one, seven kinds out of 98 might have some chance of germinating. The *Ricinus communis* and *Cucurbita pepo* are among the number. Now, if all the dangers be taken into consideration to which a seed must be exposed during a long voyage, as well as the difficulties it must meet with to find a congenial soil on landing, with other circumstances calculated to promote its germination and subsequent preservation from destruction, M. Marten concludes, with M. Alph. De Candolle, that the transportation of seeds by sea must have had a very small share in the propagation of plants to other shores, and that the hypothesis of simultaneous creations in different parts of the globe acquires much probability. M. Martens, however, omits from his calculation the geological consideration that many parts of the surface of the globe now separated by sea were at one time united.

PHOTOGRAPHING ON WOOD.

The following is extracted from the *Scientific American*:—

"In preparing wood engravings—such as are employed in all books and newspapers where the pictures are printed on the same sheet and at the same time with the types or letter-press—the picture is first drawn by hand on the smooth block of wood, and the lines and shades are subsequently raised, or rather the white surface is *sunk* by the skill of the engraver. A patent was issued on the 5th of May last, to R. Price, of Worcester, Mass., for a process of photographing on wood in lieu of drawing by hand, which has since been so far developed by the proprietors, C. J. B. Waters and Co., of No. 90 Fulton-street, this city, as to be pronounced successful by some of our best engravers. The surface is so prepared as to be sensitive to light like the glass or paper employed in the ordinary photographic processes, and the image of any object is thus impressed upon the block with greater accuracy than it is possible to accomplish by human skill. We have seen some wood blocks bearing very fine pictures produced by this means, and a number of such pictures have been engraved and printed, showing that it is practicable so to use them. The principal defect of such "sun pictures" for this purpose is their too great delicacy and faintness. If this can be overcome, and the pictures be produced with the vigour and strength of ordinary Indian ink work, the invention will very greatly facilitate the production of illustrated books and newspapers, and it is quite probable that, with practice, engravers may accustom themselves to work from these drawings as now produced, without difficulty. At present the invention is most successful in reducing engravings from copies. It is now in daily use for this purpose."

SOUTH KENSINGTON MUSEUM.

During the week ending 19th September, 1857, the visitors have been as follows:—On Monday, Tuesday, and Saturday (free days), 1,947; on Monday and Tuesday (free evenings), 7,199. On the three students' days (admission to the public 6d.), 578; one students' evening, Wednesday, 165. Total, 9,889.

Home Correspondence.

"ASSOCIATES OF THE SOCIETY OF ARTS."

Sir,—As a very old member of the Society, I shall be glad to be informed, through the medium of the *Journal*, what is meant by the designation, "Associates of the Society of Arts," alluded to in the Programme of the Examinations advertised in your columns. Is it that we members are so peculiarly distinguished by our attainments in science and arts, all of us, that we are to have humble disciples, in the name of Associates, in imitation of other worshipful societies, whom we are gradually, after due service, to permit to unloose our shoe-latchets? If we were a professional body of surgeons, or physicians, or poets, or engineers, or butchers, or bakers, or sawyers, or cutlers, or tailors, or shoemakers, the distinction might be understood, but an Associate of all these, and many more whom we number amongst our ranks, is to make the aspirant an Associate of "all things and also some others." And how is the Associate to be distinguished from the full Member? And how, if the Associate, smitten with ambition, tenders the annual two guineas to get into a "higher spear?" Will the Secretary be instructed to refuse his tender till approved by the Council? And will it not be necessary to have some special designation to distinguish the Associate from the Member, more or less ridiculous? The Engineers were once unhappy in their choice, M.I.C.E. People could not help reading the letters as a word, and infallibly recurred to their thoughts the Latin phrase, "*Parturiunt montes nascitur ridiculus mus.*" Are we all, members and associates, to set up Science and Arts patent letters of nobility after our names, M.S.A., and A.M.S.A. Old stagers will shirk the dubious honour with knowing tact, but fancy the astonishment of the world when all the Associates of our body put upon their business cards the mystic Amsa with the statement of their worldly occupations.

"Who can this Amsa be?"

would be the inquiries far and near, of the great mass of the uninitiated. Peter Parkins, Amsa, cheesemonger; Paul Larkins, Amsa, chimney-curer; Perry Popkins, Amsa, ivory-turner; Dickenson Hopkinson, Amsa, baker; Cæsar Augustus Pudds, Amsa, dancing-master; Leman Longsight, Amsa, optician. It would infallibly become a subject for the recondite inquiries of *Punch*, who would christen it a new Amsatic League, and make it a stock subject.

All this kind of thing is mere puffery, offering temptations of spurious worldly advantage as an inducement to factitious parrot study, under the name of education, with a view to make the Society, or those who make it their "oyster," the dispensers of patronage. The Society is to be a great sponge, which is to "suck up the nation's countenance, its rewards and authorities;" and, when the wielders need it, "it is but squeezing it, and, lo! sponge, it is dry again." "Nominations to appointments placed at the disposal of the Council." John-street a house-of-call for people out of place—a fountain of patronage. It requires little forethought to predict that this kind of thing will not work, and will be against the interests of the Society, which is a thoroughly heterogeneous body, made up of all classes, taking an interest chiefly in practical art, and its development in new phases, and only contingently in science. The Society essentially turns on the production of the new, and not on the routine of the old, which "science" is. Things create theories, theories rarely create things. We see this constantly, steaming across the Atlantic inclusive. I therefore think that this hobby of examinations is getting to be overridden, and is likely to degenerate into as much routine as any red-tape or circumlocution office extant. It will put us into the condition of Chinese so far as it goes, and take out the originality and manhood from amongst us. It will create a huge growth of "grinders" occupying chambers in the vicinity of the Adelphi, and gradually stir up jealousy, and then contempt. It is notorious that College wranglers are of little use for the work of the world.

At best this seems a contrivance to substitute a routine judgment of the Society to supply the want of faculties in employers, and establish a royal road to employment if not to knowledge, like an agency office for domestic servants. And this is totally at variance with the true objects of the Society, viz., to bring new and important practical things permanently before the public, and to remove impediments pressing on the development of progress. The essential qualities which constitute the greatness of the British nation cannot be produced by rule, and the Society should strenuously eschew all that savours of quackery, if it means to retain its hold of the public respect. Let it agitate, and, as Lord Granville says, "poke its nose into every thing" as much as possible, but let it beware of trying to become an oracle or certificatemonger, or vendor of diplomas, a competitor for examination customers by the agency of unpaid professors, who must eventually be paid, directly or indirectly.

If it be meant to change the Society altogether from what it is, into a new kind of London University, let us at least understand this clearly, and take the general sense of the members on the question. Those who dissent can then separate and adhere to practical discovery in the new, while the others examine in the established routine and grant diplomas. Doubtless both will have their sphere of utility.

Let it be clearly understood that education is in itself a good and vitally important thing—a blessing—but not exactly such as the competitive examiners may conceive.

P.

Finsbury, Sept. 21, 1857.

MR. THWAITES'S CYPHER.

Sir,—On looking over some of my old papers, I find an error, which is calculated to mislead general readers, in my letter to you in reference to the cypher which Mr. Thwaites, of Bristol, has discovered.

That letter was inserted in your journal of October 20, 1854, and in it I said that the cypher to which Mr. Thwaites lays claim, was first invented by Bishop Wilkins more than *half* a century ago. I ought to have said that it was invented by Bishop Wilkins more than a century *and a half* ago, and even that is not making the most of it, for Bishop Wilkins was master of Trinity College, Cambridge, in 1659, and died in 1672.

I hope your readers will excuse my inadvertence, and that you will kindly enable me to correct it by inserting this letter in your next journal. By so doing you will greatly oblige, Yours, &c.,

J. B. KEARNEY, M.A.,
Master of the Special Department, King's School, Canterbury.

Precincts, Canterbury, Sept. 15th, 1857.

Proceedings of Institutions.

Hitchin.—The twenty second annual meeting of the Mechanics' Institution, was held on Thursday, the 17th inst., David Lloyd, Esq., Vice-President, in the chair. The meeting was well-attended by the members. The report of the committee was read, from which it appeared that the Institution continues in a highly prosperous state. The *soirée* and exhibition of Works of Art, held last October, in commemoration of the twenty-first anniversary, proved highly successful, being visited by 1410 persons; the profit amounted to £7 5s. 2d. The entries in the librarian's book show a steady increase over last year, each month being higher than the corresponding one of last season. The numbers last year were 2465; this year, 2871, an increase of 406. On analysis, this number is found to consist of—

Works on Theology	75
Voyages and Travels	407
Biography	360
Poetry and Drama	79
On Arts, Sciences, &c.	309
" History	479
" Fiction	266
Miscellaneous	896
	2871

It is satisfactory to find that a large majority are of an instructive, useful character. The lectures, 12 in number, were well attended. The committee are encouraged by this fact, that much more interest exists now than when the amateur lectures were first established. The expenses attending the lectures amounted to £36 0s. 6d., the receipts to £64 3s. 9d., leaving a balance of £28 3s. 3d. in hand. The committee feel deeply indebted to those gentlemen who have so kindly aided them in this department. They are happy to be able to state that arrangements have been made for a continuance of these lectures, and that seven will be delivered before Christmas. October: 2 lectures "On Modern Egypt and the Egyptians," by J. S. Noldwritt, Esq.; "On the Wild Flowers of the Neighbourhood," by Mr. W. Dawson. November: "On Language," Rev. J. O. Seager, of Stevenage, Herts; "On Astronomy, the Solar System," by Mr. Palmer. December: "Pompeii—Past and Present," Mr. A. R. Abbott; Master Hugh Latimer, Bishop of Worcester—Martyr 1555," by Mr. Joseph Pollard. The number of works purchased for the Institution during the year has been 157, at a cost of £44 0s. 10d. The committee have much pleasure in stating that a first-class certificate and prize for agriculture were obtained at the last examination of the Society of Arts by one of the members. They hope next year to be able to record the obtaining of others at the examinations next year. The treasurer's report shows an income of £117 9s. 11½d., and an expenditure of £102 6s. 7½d. The Institution remains perfectly free from debt, and has a clear balance of £15 3s. 4d. in hand. It was carried unanimously, that the report be printed and circulated. The Rev. Lewis Hensley, Vicar of Hitchin, was elected President for the ensuing year, and the following gentlemen Vice-Presidents: William Hawkins, Esq., David Lloyd, Esq., Francis Lucas, Esq., William Lucas, Esq., James Hack Tuke, Esq. Mr. Joseph Pollard was reelected Hon. Treasurer, and Mr. George Lutchmore Hon. Secretary, in the place of Mr. Times, who resigned the office. The proceedings closed with the appointment of the Committee.

PATENT LAW AMENDMENT ACT.

APPLICATIONS FOR PATENTS AND PROTECTION ALLOWED.

[*From Gazette, September* 18.]

Dated 22nd May, 1857.

1444. Edmund Whitaker, Rochdale, Alfred Law, Littleborough, and James Fletcher, Little Clegg, near Littleborough—Improvements in steam engines.

Dated 28th July, 1857.

2060. Pierre Alexis Francisse Bobœuf, Paris—Improvements in preserving and otherwise treating animal and vegetable substances, and in the purification of oils employed therein, and which may be used for other purposes.

Dated 6th August, 1857.

2121. Sebastien Botturi, Paris, Rue de la Roquette, 140—A system of weaving for the manufacture of all kinds of textile goods, viz.: shawls, silk stuffs, carpets, knotted or unknotted, single or double faced, Gobelins tapestry, drapery, velvets, damasked linen, and various other articles, by means of a frame which replaces the Jacquard loom.

Dated 13th August, 1857.

2158. William Smith Wheatcroft, and James Newton Smith, Manchester—Improvements in valves and the chambers connected therewith, applicable to hydrants and taps for the supply of water and other fluids.

Dated 15th August, 1857.

2170. Samuel Clift, Manchester—Improvements in the purification of certain gases, and in the application of their products to the manufacture of alum.
2173. Auguste Joseph Aucher, Paris—Improvements in elastic tissues for ladies' petticoats and other similar articles.

Dated 18th August, 1857.

2194. Thomas Keddy, Handsworth, Staffordshire—New or improved machinery for the cultivation of land.

Dated 19th August, 1857.

2203. Edward Lund, Manchester—Improvements in cocks, valves, pumps, and water plugs.
2205. William Hartley, Bury—Improvements in steam engines and steam boiler apparatus.
2207. Franz Ruff, Gray's-inn-road, and Maximilian Gutkind, Noble-street—Machinery or apparatus for folding and measuring fabrics and registering the same.

Dated 22nd August, 1857.

2228. Henry Dircks, 32, Moorgate-street—An improved fire-escape—(A communication.)

Dated 25th August, 1857.

2242. Francis Preston, Manchester—Certain improvements in apparatus to be applied to the spindles of machines for preparing, spinning, and doubling cotton, and other fibrous materials.

Dated 27th August, 1857.

2266. John McIsaac, Manchester—A machine or apparatus for washing or churning.
2268. Charles Thompson and James Thompson, Green Bridge Foundry, Padiham, Lancashire—Improvements in apparatus for discharging condensed water, air, or other fluids, from steam pipes, drying cylinders, and other apparatus where steam is used.
2272. François Xavier Gentil, and Eugène Gentil, Paris—Improvements in preparing and treating asphodel in order to obtain alcohol.

Dated 28th August, 1857.

2274. John Drumgoole Brady, Calais—Improvements in saddles.

Dated 29th August, 1857.

2278. George Cumming, Edinburgh—Improvements in apparatus for thermometric, hygrometric, and barometric purposes.
2280. Jules Alphonse Chartier, Rue de l'Echiquier, Paris—Certain improvements in steam engines.

Dated 31st August, 1857.

2282. Peter Spence, Pendleton—Improvements in the manufacture of sulphuric acid, and in obtaining salts of ammonia thereby.
2284. William Clark, 53, Chancery-lane—Improvements in the application of portable rails or ways to vehicles. (A communication.)
2286. George Hallen Cottam and Henry Richard Cottam, St. Pancras Iron Works, Old St. Pancras-road—Improvements in the manufacture of children's cots and metallic bedsteads.

Dated 1st September, 1857.

2289. Henry Coates, Crawshaw Booth, near Rawtenstall, Lancashire—Improvements in heating liquids used in bleaching, dying, soaping, clearing, and sizing.
2291. George Bell, South Inch-Michael, Perth, N.B.—Improvements in reaping and mowing machines.
2293. George William Lenox, Billiter-square—Improvements in apparatus for sounding alarums at sea.
2297. Eugene Grenet, junr., and Alexis Vavin, Paris—An improved electro-magnetic machine.

Dated 2nd September, 1857.

2299. Evan Leigh, Manchester—Improvements in constructing certain parts of machinery or apparatus used in preparing and spinning cotton and other fibrous substances.
2301. Thomas Welcome Roys, Southampton, Long Island, New York—Improved apparatus applicable to the capture of whales and other purposes.
2303. James Petrie, Rochdale—Improvements in apparatus for regulating the admission of air to furnaces.

Dated 3rd September, 1857.

2305. Thomas Holland and John Rubery, Birmingham—Certain improvements in the mode of manufacturing the runners and top notches of umbrellas and parasols.
2307. Joseph Richard Atha, Heckmondwike, and William Pearson and William Spurr, Birstal, Yorkshire—Improvements in railway signals.
2309. Harry Inskip, Hertford—Improvements in fire-arms.

WEEKLY LIST OF PATENTS SEALED.

September 18th.

787. George William Sayer.
790. William Seaton.
791. Wm. Moxon, John Clayton, and Samuel Fearnley.
793. William and John Banks.
814. John Smith.
816. Jean Joseph Baranowski.
817. Frederick John Jones.
877. William Childs, junr.
1099. Henry Daniel Deane.

PATENTS ON WHICH THE STAMP DUTY OF £50 HAS BEEN PAID.

September 15th.

2013. Nathan Thompson, junr.

September 16th.

2041. William Hodson.

September 18th.

2048. G. Collier and S. Thornton.
2071. Lord Berriedale.
2102. Arthur Boyle.

September 19th.

2021. John Cunningham.
2126. Thomas Cooper.

Journal of the Society of Arts.

FRIDAY, OCTOBER 2, 1857.

EXAMINATIONS.

Mr. Edward Highton, of the Leicester Mechanics' Institution, and Mr. Edward Philip Plowman, of Bury St. Edmund's Commercial School, both of whom have distinguished themselves at the Society's Examinations, having been nominated by the Council to compete for Clerkships in the Privy Council-office, have been successful in obtaining appointments.

There were six appointments for competition, two of which were gained by Messrs. Frank Marshall and Henry Cullum, whose names were announced in a recent number of the *Journal;* and thus four out of the six vacancies have been filled by gentlemen who had previously passed the Society's Examinations with distinction.

MEETING OF COUNCIL.

The following Institutions have been taken into Union since the last announcement:—

440. Ashbourn, Literary Institution.
441. Manchester, New Mechanics' Institution.
442. Leeds, Young Mens' Christian Institute.
443. Newmarket, Literary Institution.

ON THE MECHANICAL STRUCTURE OF COTTON FIBRE.

By Gilbert J. French (of Bolton).

The following particulars respecting the mechanical structure of cotton fibre are the result of an investigation in which the author has for some time been engaged:—

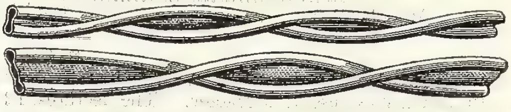
When a filament of cotton is examined under the microscope, it is seen to be twisted on its own axis somewhat like a corkscrew—differing in this respect from fibres of silk, wool, and flax, which evince no natural tendency to twist.

This peculiarity in the structure of cotton has been described by Mr. Thompson, of Clitheroe, in a paper upon the Mummy Cloth of Egypt, which he read before the Royal Society, and by which he proved that that fabric was linen and not cotton, as had been previously supposed.

Mr. Thompson was indebted to the careful microscopic observations of Mr. Bauer for a clear indication of the distinctive peculiarities in the structure of cotton and linen fibres. He discovered filaments of cotton to be invariably *flattened* cylinders more or less *twisted;* whilst those of linen retained their cylindric form and were without twist.

These facts were demonstrated by a careful drawing, showing filaments of cotton and flax magnified four hundred times, which was engraved in illustration of Mr. Thompson's paper.* About the same time, at the request of Mr. Pettigrew, of London, Dr. Ure examined mummy cloth under the microscope with a similar result. He does not, indeed, so strongly insist on the natural twist of the fibre, but he distinctly alludes to its "spiral structure,"* and still more distinctly exhibits that peculiarity in all the woodcuts of magnified cotton fibres, figured in his *Philosophy of Manufactures.*†

The example here introduced is copied from a portion of the engraving of Bauer's drawing already referred to. It exhibits parts of two fibres of ripe cotton, highly magnified.



The twist in cotton fibre has also been referred to by Dr. Royle, in his "Culture and Commerce of Cotton in India," where an admirable example is figured of Sea Island cotton from a microscopic drawing prepared by Mr. Cornelius Varley for Mr. Thompson.

My own investigations, so far as I have been able to carry them, entirely coincide with the facts here recorded; but it may be satisfactory to say that an ordinary microscope, such as may be purchased for a few shillings, in the hands of an inexperienced observer clearly exhibits the spiral structure of cotton fibre.

As, however, the unaided eye fails to detect the slightest twisting, even under the most favourable circumstances, it is not improbable that this peculiar corkscrew mechanism of the fibres of cotton has been observed by, and is known to comparatively few of those parties most interested in its use, which may account for the fact that the natural twist has never been considered (so far as I can learn) with reference to its possible effect on any of the processes of the cotton manufacture.

On the authority of Mr. Bauer we learn that "the twists or turns in a fibre of cotton are from 300 to 800 in an inch."‡ My own observations upon different varieties of cotton lead me to believe the average number of twists to be very much less; and in this I am supported by the opinion of G. Lawson, Esq., Demonstrator of Botany and Vegetable Histology to the Edinburgh University, who has recently examined specimens under the microscope at my request. Mr. Lawson reports that "the number of complete turns is in some cases equal to 200 in an inch, but more usually they are much fewer."

Mr. Bauer, who appears to have had favourable specimens for examination, states that fibres of cotton taken from unripe and unopened pods are always *untwisted cylinders*, and this form they retain ever after; but the fibres taken from ripe and open pods are *flattened and twisted*, and "in that respect they undergo no change through the operations of spinning, weaving, bleaching, printing, and dyeing, nor in all the subsequent domestic operations of washing, &c., till the stuff is worn to rags; and then even the violent process of reducing those rags to pulp for the purpose of making paper, effects no change in the structure of these fibres." "With Ploessl's microscope," he adds, "I can ascertain whether cotton rags have been mixed with linen in any manufactured paper whatever."

From the authorities I have quoted, it may, I apprehend, be assumed that spiral twisting is a condition inherent in the fibres of ripe cotton, but which does not appertain to those which have been gathered unripe.

It would be interesting, and probably useful, to ascertain the exact time at which the flattening and twisting of the fibre occurs; most probably it accompanies and is caused by the desiccation of the fluid contained in the hollow cylinders of cotton upon exposure to the rays of the sun after the expansion of the protecting leaves.

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* This paper and engraving may be conveniently referred to in the Appendix to Baines's *History of the Cotton Manufactures*, where both have been republished.

* *Philosophy of Manufactures*, second edition, p. 101.

† *Ibid*, pp. 86, 87, 89.

‡ Baines's *History of the Cotton Manufacture*, p. 537.

This can only be learned by a careful observation of the growing plant; but there is good evidence that the fibres, before and up to the time when the pod opens, are cylinders without any twist.

I suggest that yarn might be spun from cotton gathered when protected by the covering pod and before exposure to the direct action of the sun's rays, materially differing in many respects from that which is manufactured from the usual (so called) ripe cotton. It is very probable that so obvious an experiment may have been already tried and proved to be unsuccessful; as, however, I have never heard of it, I venture to suggest it, though it is merely incidental to the main purpose of this communication.

Whatever means nature may employ to produce the flattened and twisted arrangement of cotton fibre in the opened pod, it may be fairly assumed that the cause acts uniformly, and is followed by a uniform result. If the twist follows the course of the sun—a supposition powerfully supported by analogy of the known effect of its agency upon many other plants—then, the twist in all fibres in the same pod must be in one and the same direction; so also will be the case with each pod of the same plant, each plant of the field, each field of the district, and with each district of the hemisphere.

I have anxiously endeavoured to verify this hypothesis by careful observation of such specimens of cotton, in a proper state for the purpose, as I have been able to procure. These, I regret to say, have been exceedingly scanty, a fact which induces me to make this communication, as I have myself no opportunity of carrying out the enquiry, or of obtaining the necessary samples; so that I can only hope to bring forward such facts as may induce my readers to take some interest in the subject, and also to assist by procuring samples of cotton in the pod before and after its expansion, from various latitudes in both hemispheres.

Such observations as I have been able to make lead me to believe that the twist in cotton fibre follows the course of the sun. It is true that, in almost every seed with its attached cotton I have yet examined, some of the fibres—more or less—appear to be twisted, *in a portion of their length*, differently from the greater adjacent mass; but this I apprehend to be the result of accident, as a very slight thrust disarranges the delicate filaments, and this is inevitable in the packing process as now conducted.

I am, however, by no means desirous that my opinion in this matter should be too fully relied on, as I readily confess myself to be comparatively unpractised in the use of the microscope. I have therefore sought the assistance of the gentleman already mentioned, whose experience and skill in this department of science make his opinion of especial value. The following letter, though not to be considered conclusive, corroborates my own previous observations, and shows the importance of further investigation upon proper specimens:—

"University, Edinburgh, 8th July, 1857.

"Dear Sir,—I have made an examination by the microscope of the specimen of Sea Island cotton sent by you, with reference to the point mentioned in your letter, viz., the direction of the spiral of the fibres, and I beg to report as follows:

"The fibres are for the most part twisted from left to right (that is, in the direction of the sun's course); a few of the fibres, or at least portions of them, are twisted in the contrary direction (right to left, or against the sun's course); and portions of the fibre occur in which there is scarcely any twist at all, being in the form of a crumpled ribbon.

It may here be stated that the development of the cotton fibre has not been traced by any previous observer (so far as I can learn), with the special view either of ascertaining the prevailing direction of the twist, or of investigating the conditions by which it is regulated. It is, therefore, impossible, from the examination of a single specimen of mature cotton, to predicate what may occur in other kinds of cotton, or even to say with certainty that the prevailing direction of twist in that specimen will also be found in other samples of Sea Island cotton, although I think such is extremely likely to be the case. The specimen of Sea Island cotton now submitted is certainly more *strongly* twisted than samples of Indian cotton which I examined some time ago.

"In the event of your desiring a further prosecution of the subject, please bear in mind that unripe and unopened cotton pods are most instructive in such an investigation.

"I am, dear Sir, yours faithfully,
"G. LAWSON, F.R.P.G.
"Demonstrator of Botany and Vegetable Histology to the Edinb. University,
Sec. Bot. Soc.

"To Mr. Gilbert J. French, Bolton, Lancashire."

I have examined numerous varieties of cotton wool, and find a great disparity in the number of twists in a given length of fibre when seen under the microscope. Unfortunately, I have no precise knowledge of the circumstances and locality of the growth of the specimens, and therefore dare not offer any opinion as to the probable cause of the greater or less twist. It would require a long continued series of careful observations by skilful microscopists, to arrive at any safe conclusion on this point. If I am at all correct in the deductions which I venture to draw from the facts already ascertained, and to which I shall now draw attention, such an investigation is highly important to the future interests of the cotton trade.

Cotton is (I believe) invariably spun into yarn without reference to the original and natural parallelism of its fibres. First the saw-gin in detaching the filaments from the seeds, and afterwards the scutching and blowing machine in its attempt to cleanse and separate the closely packed masses of fibre, entirely destroy the order in which these fibres had been previously arranged by nature. This produces two results, both of them detrimental to the succeeding processes of manufacture. I will mention the less important first.

Cotton fibre, whether examined under the microscope or in the flakes sometimes met with in bales with the natural arrangement undisturbed, is found to possess a pearly lustre, which in the finer kinds becomes iridescent. This quality appertains also to flax, and in a higher degree to silk, but is not observed in cotton thread or woven fabrics, except when imparted to them by factitious appliances—a practice so common as sufficiently to prove that the retention of the natural lustre is an object of importance.

This lustre is probably dependent upon the atomic arrangement of the cotton fibre. If these minute particles occupy uniform positions from the base to the point of the filament, each separate fibre and any aggregation of fibres arranged in natural parallelism receive and reflect the light that falls upon them—hence the lustre; but if this arrangement be reversed by placing the parallel fibres in somewhat equal numbers from point and from base, there can be no lustre, as the light is diffused from numberless reversed points instead of being reflected from a smooth surface composed of an aggregate of atoms uniformly arranged.

To make this more evident, I will refer to a similar effect produced by the same means upon another material. Spun silk is a technical name for threads prepared from waste silk, and such cocoons as, from accident or malformation, cannot be reeled for use in the usual manner. These are treated much in the same way as cotton. The natural parallelism of the fibres is broken up by machinery, and a new arrangement brought about by dint of carding and roving. The threads resulting from this process resemble cotton much more than silk, and have lost in a great measure the brilliant lustre for which that material is principally valued.

Forty years ago, linen thread and linen cloth possessed a lustre which is rarely met with in the manufactured flax of the present day. When spun by hand, the natural parallelism of the fibres was retained; but the practice in our modern mills is, I am informed, to cut each long lock of flax into four lengths, which, after being heckled, are presented to the spinning machinery without regard to the natural direction of the fibres. Hence, as in the case of cotton and of spun silk, the reflecting surface of the material is broken up, and there is consequently a loss of the desired lustre, though the quality and strength of the thread may in all probability be improved. Arguing from the analogous effects upon silk and flax, I venture to hazard the inference, that a permanent lustre might be given to threads and fabrics of cotton by retaining the parallel position of the fibres which nature has established in the seed pod.

Assuming the hypothesis, that the twists in filaments of cotton are in one direction, to be correct, I suggest that, by continuing this arrangement throughout the process of spinning, the result promises a thread of greater tenuity, with more strength and smoothness than can be produced by the present practice, which twists one moiety of the fibres composing a thread in the direction of the natural torsion and the other in the reverse direction.

I have shown that the spiral convolutions of ripe fibres of cotton are permanent. No process of manufacture, or of washing and wearing, succeeds in destroying or even modifying this peculiarity, and, as a necessary consequence, each distorted fibre exerts an unceasing effort to resume its natural position: hence the innumerable ends which perpetually show themselves on the most carefully manufactured cotton threads and fabrics. Human ingenuity may be said to have almost exhausted itself in the marvellous contrivances which have been applied to the removal or mitigation of this evil. The daring expedients of passing delicate threads and muslins over bars of red-hot metal, or through curtains of flame, are equalled by the contrivances of the bleacher in smoothing, polishing, and fastening to the surface of the cloth each rebellious point. These expedients serve, however, but for the time, since the friction of wearing and washing, and even the changes of temperature alone, induce action in the elastic fibres thus unnaturally convoluted. They persist in an endeavour to escape from their constrained position, and are assisted by every strain upon the thread, as may be seen by the fresh points which at such times perpetually start from the surface.

If in spinning cotton the system of parallelism, which nature has given to the filaments, can be retained throughout the after processes, and the suggestive hint which she offers by that system to form the artificial twist in accordance with the natural torsion of the fibre, were acted upon, yarn would be produced with some amount of elasticity, on which a strain would have the effect of bringing all the component fibres into closer contact, their ends, whether point or base, all clinging inwards to the centre of the thread. The most perfect possible yarn (if I may be permitted to suggest its production as possible) would be that in which the number of artificial twists in a given length coincide with the natural twists in the fibres from which it is made.

It would be altogether premature to descant on the advantages which the cotton trade would derive from the use of yarn such as I have described. To all practical spinners and manufacturers these will at once suggest themselves; and though they may perceive objections and impediments to its production which I have not noticed, yet means may be found to overcome or elude these impediments. At all events, I trust I have shown such a case as may prove a sufficient excuse for bringing forward the subject.

At the present time, when the cry is not for *better* but for *more* cotton, it is probable that my suggestions may not be entertained, though I believe that even now they are worthy the serious consideration of fine spinners. But at some future period of depression in the cotton trade, when active competition stimulates improvement, I presume to predict that the views I have endeavoured briefly to explain will be acted upon; and cotton, which is now held to be the humblest of all the fibres used for clothing humanity, may be elevated to a higher and more useful position—rivalling flax, and even silk, in the beauty of its lustre, delicacy, strength, and durability, as it now surpasses them in the universality of its utility.

There is one obvious objection to the successful execution of the plan I have proposed. I allude to the evident difficulty of procuring cotton retaining its natural parallelism. Clearly the saw gin abroad and the scutching machine at home destroy this in the most effectual manner, and cotton, to be used as I propose, must not come within their injurious grasp.

The primitive modes of separating the seed from the fibres have been discontinued only because they could not keep pace with the increased speed of other machinery, and have given place to the American saw gin, which has nothing to recommend it but the facility of its operation, and the large amount of bad work which it executes in a short time. I admit that in the present state of the trade the extensive use of the saw gin cannot be dispensed with, though its effect on the fibres is most injurious, even when they are spun by the present process. The delicate and elaborate operations of carding are mainly intended to remedy the injury inflicted by the saw gin, by forcibly dragging into parallel juxtaposition those fibres which it had previously disrupted. But I shall endeavour to show that by the ancient modes of operating upon the cotton pods, it may be effectually freed from the seed, and the natural parallelism retained in its integrity.

The primitive method of separating the fibre from the seed, as practised by Indian females, was this. Conveniently seated, with a smooth slab placed on the ground before her, the woman arranges on it a quantity of cotton, freed by hand from the pod, but retaining the attached seeds; over this she presses a roller by the action of her feet. The masses of fibre pass under the roller and fall over the edge of the slab next her person; but as the seeds cannot pass beneath the roller, it tears them from the fibres and they fall over the edge of the slab at its opposite end. Now, to manage this operation in the quickest and most effectual way, it is evident that the bunches of fibre must be placed on the slab with their points next to, and their seeds farthest from, the roller; for if placed in a contrary position, both seeds and cotton would be pushed together over the farther extremity of the slab. It follows, therefore, that the original position of the fibres with reference to each other need not be materially changed by this operation.*

The roller gin, or churka, as formerly used in India, afforded the same or a still better result. The cotton was passed between fluted rollers of teak wood, placed so close together as to prevent the entrance of the seeds, which were necessarily left behind. For the effectual working of this machine,† the cotton must have been presented to its action points first, and, consequently, it would pass from between the rollers undisturbed as to the parallel position of the fibres. If this cotton could be received from between the rollers in continuous flakes by any of the numerous ingenious methods common in British cotton mills (assuming it to be tolerably clean), it would be in a state ready for carding, possessing all the advantages of undisturbed parallelism of which I have endeavoured to show the importance.

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* In Dr. J. Forbes Royle's *Culture and Commerce of Cotton in India*, p. 541, there is a figure of an Indian female using the foot roller.

† Engraved in Baines's *History of the Cotton Manufacture in Great Britain*, p. 66.

It is possible—perhaps not improbable—that the delicate "webs of woven air," so fine as to be impalpable to the touch, and woven from threads "scarce discernible," for which Eastern India was so famous in former days, may have been made from picked samples of cotton, freed from seeds in the manner described above, carefully manipulated and spun in the undisturbed integrity of its natural arrangement. It is scarcely possible to imagine that such fairy-like fabrics could be produced from the dislocated fibres which the British spinner is compelled to use.

Sea Island cotton, a beautiful and expensive variety used by spinners of the finest yarns, is freed from its seeds by a gin, similar in principle to the East Indian churka; but its operation is aided by the action of a vibrating iron comb, which, together with the after treatment of tossing the fibres about in a wheel where they are exposed to a current of air, completely destroys their natural parallelism, though it avoids the damaging effect peculiar to the saw gin,—a machine which, by doubling many of the fibres caught in its teeth, and dragging them through apertures too narrow to admit the passage of the seeds, causes the ends of the double filaments to be brought in contact with each other, their convolutions thus become entangled, and they remain permanently doubled up as comparatively valueless *waste* cotton.

It cannot be doubted that if the importance of preserving the natural position of the filaments was ascertained and acknowledged, effectual means would soon be taken to import cotton in a state fit for being spun in the manner I have proposed.

Let it be remarked that it is for certain purposes only, such as warps of all kinds, sewing thread, lace, shirting, &c., &c., that the proposed change would be at all useful. For the great bulk of the manufacture it would be unsuitable, and altogether objectionable for the wefts of such fabrics as have a raised or carded surface, but a richer and fuller pile might be imparted to these, by the use of weft spun in a contrary direction, that is, in opposition to, instead of in accordance with, the natural torsion of the fibre. The effect of this would be to double the number of ends subject to the raising action of the card.

It is important that extended microscopic observations upon carefully selected samples of cotton in the pod, should establish or confute the assumption of uniform direction in the natural torsion of the fibre.

I desire this communication to be considered as *suggestive* only. It claims to *prove* nothing. But the suggestions are such as, I hope, deserve attention. I shall be glad if my propositions can in any way be subjected to the test of actual experiment.

MEDITERRANEAN TELEGRAPH.

The portion of the Mediterranean Extension Telegraph Company's cable already completed, consisting of 582½ miles, was recently tested by Mr. H. V. Physick, telegraph engineer, and Mr. Andrews, superintendent to the Mediterranean Company. The testing of the entire length of the cable was satisfactory. With only two cells of a small sand battery a distinct signal was obtained, and with four cells uninterrupted telegraphic communication was maintained, and messages were transmitted by means of the single needle instrument throughout the entire length. The new line will connect Cagliari with Malta and Corfu, and the entire length to be manufactured will consist of nearly 1,000 miles. The Messrs. Newall, by whom the cable is being made, expect to finish the work by the middle of this month, and the whole line will be submerged by the end of it. The cable consists of a single conducting wire, with an outer protective sheath of iron wire; but the outer wires, unlike those of the Atlantic Company's cable, are not subdivided into a number of small filaments, but each strand is a solid mass and distinct in itself. The greatest caution has been exercised at each stage of the manufacture. The gutta percha wire, consisting of two distinct coverings, has been supplied by the Gutta Percha Company, and has since been successfully subjected to severe testing in water under hydraulic pressure. The Messrs. Newall have undertaken to lay down the cable throughout the entire length, and to maintain it in working order for a certain specified time and for a given sum of money.

HYDROSTATIC SCREW PROPELLER.

This invention is the property of Messrs. Samuel Stevens and William Grimshaw, of Southampton, its main feature being the bringing into use as a motive power the water in which the vessel floats, and requiring only a small engine to pump that water through a hollow screw propeller, and thus dispensing with the long, heavy, and expensive iron shaft, and also the tunnel leading from the machinery to the screw, thereby, as the inventor says, doing away with all heated bearings, which are now a great hindrance and annoyance to engineers, and prevent them driving at high velocities. The inventor has long conceived the principle of his invention, which he believes will be the stepping-stone to a great revolution in screw vessels, and save one-half in the cost of machinery, and a considerable sum in coals. Mr. Stevens' experimental vessel is now before the public, and the engineering world may form their own judgment on its merits. In order to bring it before the public, Mr. Stevens purchased a steam-paddle wherry, an open boat of but 28 feet long, and less than 6 feet in the widest beam, but drawing but 2 feet of water only, having a one-horse power engine. He made no alteration in the engine, but simply took off the paddles and added the pump, in this case under the side seat aft, which is worked by the engine, and by forcing water through the hollow screw propeller, produces a powerful rotatory motion where only it is required, namely, in the screw, which is driven 500 revolutions a minute, and produces the same speed she had attained with the paddles. If a new engine had been constructed, much of the machinery would not have been made. One cylinder and one pump, worked fore and aft, without shafts or cranks, are all that would be required for any vessel afloat. The motion is said to be uniformly steady, with no perceptible vibration. By a simple contrivance, the man at the helm can reverse the motion of the screw, without stopping or interfering with the engine, and go back, again forward, or stop the screws, as he pleases. The going round is said to be perfectly easy; and the working against wind and tide appears to make no difference, except in speed, and that but trifling. With a boat thus imperfect, and an engine too cumbrous for its required purpose, the rate of speed is said to have been considerable. For a whole day's work in the docks, &c., but one cwt. of coals was consumed. Mr. Stevens states that his invention would prevent the risk of a ship being destroyed by fire, as pipes could be carried all over the ship, which would be always charged with water sufficient to extinguish fire to any extent, and the pipes so charged would assist the working of the engines.

THE METEOROLOGY OF ENGLAND.

The British Meteorological Society has recently issued its summary of meteorological phenomena observed during the quarter ending June 30th, in different parts of the United Kingdom. This report on the meteorology of England is the production of Mr. J. Glaisher, F.R.S., secretary of the British Meteorological Society. The following particulars are mentioned in this report, namely:—The times and places at which thunderstorms occurred; at which thunder was heard, lightning not seen, lightning seen, thunder not heard; at which hail fell; at which fog prevailed; at which snow fell; at which solar and lunar halos and auroræ were seen. Hail fell on 15 days in the month of April.

SUGAR AND THE SORGHUM.

The following is extracted from the *Scientific American*, and is an abstract of a paper read by Dr. A. A. Hayes, on the above subject, before the Scientific Association at Montreal:—

"So rapidly has chemical science progressed of late, that the the term 'sugar' has now become a generic name for a class of bodies with the most marked diversities of sensible characters and composition. We have sugars which are sweet, others which are slightly sweet, and some destitute of sweetness; some are fermentable, others do not undergo this change; some are fluid, more are solid.

"Adopting cane sugar as the most important kind from certain inherent qualities, we find its sources abundant, but not numerous. So far as observation has extended, its production by a plant is definite; a change of locality, even when accompanied by a marked change in the habit of the plant, does not alter essentially the nature of the sugar it produces. Thus the cane of Louisiana rarely matures and is an annual, while in the soil and climate of Cuba it enjoys a life of thirty, or even sixty years. The juice of our southern plant always contains more soluble alkaline and earthy salts than is found in the cane of Cuba, but its sugar is secreted as cane sugar. The juice of the sugar beet, of water melons, and a large number of tropical fruits, the sap of the maple and date palm, afford cane sugar. In these juices and saps, when concentrated by desiccation in the cells of the plants, it always appears in regular, brilliant crystals, of a prismatic form, clear and colourless; distinctly indicating a vital force in the plant, separating it from other proximate principles and leaving it in its assigned place pure.

"The class of sugars next in importance includes, under the general term Glucose, a number of sugars having varied characters, which should be separately grouped. Among them are the sugars of fruits, seeds, and grasses; those produced in the animal system, and the artificial sugars made from starch, grains, and sawdust. The varieties of glucose are both solid and semi-fluid. When solid the organic tendency to rounded surfaces is generally seen. The semi-fluid forms often manifest a disposition to become solid on exposure to the air, and they then experience a molecular change, which produces crystals having new relations to polarised light and different physical and chemical characters.

"Individuals of the class are easily distinguished from each other, and most clearly and remarkably from cane sugar. The plants producing the natural glucose sugars mature their cells as perfectly as those producing cane sugar, and the secretion can be found as distinctly isolated from other principles as cane sugar is, even when the glucose is semi-fluid. Hence we are able to determine by microscopical observations, aided by chemical tests, the presence and kind of sugar in the tissues or sap of a plant, often without incurring the risk of change of properties through the chemical means adopted for withdrawing the sugar. The *Sorghum vulgare*, or sacharatum, belongs to the tribe including grasses. The unsuccessful attempts made to crystallise sugar from the juice of the Sorghum, produced in different climates of our country last year, indicated that it contained no cane sugar, or that the presence of some detrimental matter in the expressed juice destroyed the crystallizable character of cane sugar. My observations commenced after I had obtained several specimens of the Sorghum, and have been continued on the semi-fluid sugar, likewise from different parts of the United States, with uniform results.

"When a recent shaving of the partially dried pith of the matured stalks of the Sorghum is examined by the microscope, we observe the sugar cells filled with semi-fluid sugar. After exposure to air it is often possible to distinguish some crystalline forms in the fluid sugar. These grains, after being washed, cease to present a clear crystalline character, and have the hardness and general appearance of *dry fruit sugar*. The most careful trials I could make failed in detecting cane sugar in any samples of the Sorghum stalks, or in the samples of sugar, including one made by Col. Peters in Georgia, prepared under the most careful management. I must therefore conclude, that the Sorghum cultivated in this country does not secrete cane sugar or true sugar; its saccharine matter being purely glucose in a semi-fluid form."

SOUTH KENSINGTON MUSEUM.

During the week ending 26th September, 1857, the visitors have been as follows:—On Monday, Tuesday, and Saturday (free days), 4,460; on Monday and Tuesday (free evenings), 6,776. On the three students' days (admission to the public 6d.), 513; one students' evening, Wednesday, 141. Total, 11,890.

GOVERNMENT SCHOOLS OF ART.

The first distribution of the National Medals for Drawing, among the Students of the Schools of Art of the United Kingdom, will take place at Manchester, in the Town-hall, on the 9th instant. The distributions will be made by the Lord President of the Council, the Rt. Hon. the Earl Granville, and the Vice-President of the Education Committee, the Rt. Hon. W. F. Cowper.

Home Correspondence.

THE DECIMAL QUESTION.

SIR,—In your *Journal*, No. 244, and in reference to my last letter, Dr. Gray, "with a perverseness for which it is difficult to account," and which, after all that has been said and written on this subject, is more than ever "unjustifiable," continues through five tedious columns, without producing a single fact, or any sort of evidence, to wrangle for that which I have stated over and over again, and proved in my last letter to be an utter fallacy, namely, that the change to the decimal system of weighing bullion has been attended by an increase instead of a diminution of labour.

Dr. Gray and I do not dispute upon equal terms, for on this subject he seems to consider himself quite free to wander over the whole realm of imagination. If the question were one as to the proper stuffing for a goose, or whether, when it was stuffed, it was to be put away among the geese, or the swans, or the ducks, I should not think of questioning Dr. Gray's authority, except upon a higher authority or a palpable fact. It is Dr. Gray's business, and if he makes an error, either of fact or inference, it is at the expense of his reputation. Now, this matter of the purchase and sale of bullion is part of my business, and if I were not master of it I should not be fit to hold the place I do.

Does Dr. Gray imagine for a moment that I continue this controversy for the purpose of getting the better of him? He is no authority on the subject—*knows* nothing about it—and is worse off than merely ignorant, because he is misinformed and prejudiced; and the whole of his evidence on the decimal question is just what his letters on this subject have been, one-sided, and, all through, the work of a special pleader. There is, therefore, no fame to be acquired in vanquishing him. All I desire is, for the sake of the decimal system, which I hope to see introduced, to set right what the Doctor has set wrong.

If Dr. Gray really desires to be informed upon this subject, and instead of prowling about the purlieus of the Bank, on the watch for such stray facts as seem to favour his views, and of listening to those who only palter with him in a double sense, will come down to the Bank any morning, I will introduce him to the principals of the Bullion Office, and to all the chief bullion brokers in London, and he shall hear their direct testimony as to whether the decimalization of the Troy ounce has been an unmixed advantage or not.

Although I do not propose to follow the Doctor through his five-column commentary on my last letter, I must beg to notice a few of the mare's nests he has found with so much glee.

The average influx and efflux of gold for the ten years before 1851, was £6,800,000.

In 1851 it amounted to £11,900,000, and still there was no new clerk appointed, though the pressure on the office was very great, and part of the work often in arrear.

In February, 1852, the Australian gold began to come in in considerable quantities, and in August, 1852, so great was the pressure of business, that it was found necessary to re-arrange the office, and to appoint a new clerk.

Now, what participation had 1851 in that increase of 1852? Just no more than it had in the clerk. The clerk came with the increase of work, when he was wanted, and not before. He came in August, and from that month till the 1st of November, the business continued to increase by the imports of gold, not by preparations for the decimal system, as the Doctor insinuates, for those preparations were made out of the office, and in November and December, after the introduction of the new system, the business had so much increased that more than one-fourth of all the business of the year was done in those last two months.

The clerks have not been increased since the introduction of the decimal system, though the business has very considerably increased, and it is much better done, and better accounts are kept.

I am sure that the principal of the office is quite within the mark when he says, as he does, that twice as much work can be got through under the present system as in the same time under the old. So much for mare's-nest No. 1. Now for mare's-nest No. 2.

The Doctor finds that I have most ingeniously taken no account of the fact, that since the new system came into operation, only £20,000 of silver has passed through the office.

It is almost a pity to undeceive him, he is so happy; but the damning fact must be told, that the Bank weigh silver for some of the brokers and for the public; that nearly all vessels that bring silver to England discharge their cargoes into the Bullion Office of the Bank, and whether it is bought by the Bank or the public it makes very little difference to the labour of the office; that, from the altered relative values of silver and gold, and from the great demand for silver for the East, since the new system, a considerable increase in the business of the silver department of the Bullion Office has taken place. So much for mare's-nest No. 2.

To goldsmiths and jewellers, weighing is not an important part of their business; they are either manufacturers or shopkeepers, and a little trouble in weighing, more or less, is of no consequence to them. It is not worth their while, nor ever will be, to make the change till the law renders it compulsory.

The Doctor refers me to Mr. Ellis, the principal of the Bullion Office, for "an entirely new set of tables of the values of foreign coins." There are no such tables in the Bank, nor ever were, nor are any such ever wanted. Foreign coins are purchased at so much the ounce, not so much the ounce standard, because their value is known, and no tables are, therefore, required. So much for mare's-nest No. 3.

The Bank, the Mint, the bullion brokers, and the bullion importers, in spite of what those good friends the Doctor boasts of can say, all heartily concur in one thing, that the change has been an unmixed advantage. In the United States, where the same change has been made, the same benefits are acknowledged. As for those "two chief officers" of Her Majesty's Mint, who call the new system by a name so indelicate that our immaculate Doctor, with a fitting blush worthy of Mrs. Honour, bashfully shrinks from repeating it, I believe their names are Harris, and that they are denizens of the clouds that after dinner float in the Doctor's brain; they are related to those "two of the largest bullion brokers" who refused to use the system, whose names he is bound over not to mention, and who are also "children of the mist." With them also dwell those extensive importers of bullion, with whom he is hand and glove, who launch out in praise of the spirited manner in which the Bank's "foolish innovation" has been resisted.

But who is that other informant whose name the Doctor "is not at liberty to give, as he states that he is unwilling to subject himself to my reproaches." Is he one of the many motes that people the beams in the Doctor's sunny hours. I hope so, though he cannot be a pleasant creature. I should be sorry to imagine myself likely to be thrown into communication with one so thoroughly contemptible as to fear my reproaches more than he loved the truth. I cannot, however, notice all the Doctor's airy friends, nor follow him all through his tiresome letter, which does not contain an undistorted fact or a correct inference. Dr. Gray is too much for me. I am overwhelmed by words—stifled—just as the Decimal Commissioners are by the wishy-washy evidence they have evoked, and the Doctor's collection of trashy pamphlets.

It is the vice of collectors that they will be eloquent without regard to the value of the thing or the time of other people, even down to our dear old friend and curator the Magpie, who would just as soon chatter you five columns long over a gilt farthing as over a golden guinea.

If Dr. Gray really desires no longer to speculate upon this subject, but to know for himself something about it, let him accept my invitation. He will be none the worse for it, though I may not be able to make a Cambist of him.

"Ex quovis ligno non fit Mercurius."

I am, &c., W. MILLER.

Bank of England.

Proceedings of Institutions.

Braintree and Bocking.—At the Mechanics' Institution on Saturday evening, the 26th ult., Mr. Buckmaster delivered an address in the Corn Exchange, explanatory of the Society of Arts' scheme of examination, and the importance of evening classes in connection with Mechanics' Institutions. The chief points of the address were—the desirability of inducing young men to attend evening classes from the period at which they leave school until they become occupied with the duties and responsibilities of adult life; that they should work with a view to the examination of the Society of Arts. The employers of labour were strongly urged to encourage this movement, by promoting and advancing the interests of those young men who had occupied their leisure hours by regular attendance at the classes. A discussion took place on the different points advanced by Mr. Buckmaster, in which Mr. Courtauld, the Rev. Mr. Davis, and other leading gentlemen and working men took part. A resolution was unanimously adopted to establish evening classes in connection with the Institution. Mr. Saunders, a gentleman who has had considerable experience as a teacher, offered to undertake the general superintendence of the classes. Instruction in the ordinary subjects of an elementary education is all that will be attempted for the present.

Sydney, (New South Wales).—The School of Arts.—The winter season, during which time only lectures are delivered at the School of Arts, was inaugurated on the 23rd June last, by a lecture from Dr. Woolley, before a large audience. Dr. A'Beckett occupied the chair. In the course of his address the lecturer remarked that the School of Arts had now reached its twenty-fifth year, and was in a better position than ever. He had heard objections which seemed to shew that the purpose of this winter course was not universally understood. These objections resolved themselves into two: that the lectures were not sufficiently popular in their character; and that they were desultory and unconnected in subject. The lectures, it had been urged, were popular neither in matter nor in manner. The subjects chosen were by no means always calculated to attract or to amuse mixed assemblies, and were often better adapted for academic schools, or the councils of philosophical societies. But this complaint mistook the primary object and distinctive machinery of the School of Arts. It was true that they aimed at pleasure as well as profit—they associated not as philosophers only, but as men; not merely for co-operation in labour, but for sympathy in relaxation and enjoyment. Their province was the social and moral, as well as the intellectual; and their scientific usefulness would very much depend upon the part which they took in the general diffusion of refinement and civilization—the union of the Muses with the Graces—the marriage of earnest knowledge with light-hearted wit. The kindred societies lately springing up around them, however differing in other respects, agreed in this—that the regeneration at which they aimed was universal, not partial: they arrayed our whole humanity—the faculties of thought, will, and taste—in one alliance against the ever-confederate assaults of ignorance, ungracefulness, and vice. Their own cherished ideal it had long been to reproduce, with the more favourable appliances of our age and social organization, the image of those Grecian Gymnasia, where not only bodily alternated with mental exercises, but the sober hue of study was enriched and relieved by a golden thread of joyous sport or pleasant conversation. But to aim at each in turn was not to confound them together—to blend harmoniously the colours of life was not to mingle them in one neutral tint. The succession of night and day was better than perpetual twilight; hard toil refreshed by hearty play was healthier and happier than a never-ceasing round of working made easy, or play improved to instruction. Here lay a constant quicksand of popular societies. They were in danger of forgetting that rest was only the variation of activity; that the first law of progress, the inexorable condition of all growth was, "do everything with thy might." If there was no royal road to learning, there was certainly no people's by-path. Globules of instruction dissolved in tumblers of amusement, were like delicate comfits to a hungry man; they tantalized without satisfying the appetite; they enfeebled the powers until they rejected solid meat, whilst the light food they craved yielded no nourishment. There was no occupation more wearisome or enervating than dallying with science for pastime. It was a most fatal form of double-mindedness; the portal of intellectual death. To promise the fruits of knowledge without the labours of cultivation, or any other fruit except increasing power of labouring; to disguise the difficult discipline under a comic mask—was to resemble the priest who led his people's revels in the valley, instead of strengthening their patience for the vigil at the mount. But the spirit and intention of these lectures was anything rather than philosophy in sport. In all its aspects, and not least in its intellectual aims, their institution was nothing if not in earnest. Its fundamental principal was, that education was the business and duty of the whole life, not of any period; of every rank and occupation, not of certain privileged classes and professions; that youth, though the fairest season for laying the foundation, was all inadequate to raise the superstructure of solid and well-balanced knowledge; that every trade, however apparently unfavourable to study, might be made subservient to mental discipline; that every workman must have time of leisure from his ordinary craft, and was bound, for the sake of himself and of others, to employ it in the cultivation of those faculties with which God had endowed him. It was the principle of that Society to encourage perseverance under all discouragement, whether in repairing the defects of their early nurture, or in extending their researches into one or another of the many-sided and inexhaustible fields of truth. And the distinctive law of their union was mutual aid and reciprocal instruction. They were a kind of co-operative university. They had amongst them no recognised doctors or professors; no exclusive oracles of wisdom; no authoritative fountains of learning. How valuable, then, was the stimulus of association. They required the meed of applause for successful diligence; a jury of their peers to cheer them by confirming their conclusions; to correct their errors—to direct their energies. This was the special use and object of the Winter Lectures. It required to be more distinctly understood that that platform was not for a selected few. The society invited every member to ascend it whenever his private reading should have yielded him matter of interest or value—and to persist in reading that he might ascend it, and contribute his part to the general enlightenment. It was the boast of an old Roman family that every private clansman was able, at need, to command an army. It should be the ambition of the School of Arts, that as many as possible of their associates should be qualified to deliver a lecture to an intelligent and instructed audience. Then alone were they fulfilling the obligation of their fellowship, when every lecture which they heard enkindled the worthy desire of similar usefulness, or reminded them of the duty to repay to others that which they themselves received. Lectures upon such a plan would inevitably assume a motley appearance, and seem, though they really were not so, inconsequent and desultory. They must, perforce, be as varied as the tendencies of educated taste and the objects of scientific contemplation. Nothing ought to be excluded which afforded matter for systematic enquiry and methodical discourse. And nothing needed to be excluded for the sake of popularity. The old adage—"I count nothing strange that is human," was not confined to moral sympathies. The chain which Cicero described as binding together all the liberal arts was rather an electric wire which connected the most opposite and distant regions of the mind, and helped all thinking men to understand and enjoy each other. Accordingly their lectures had as wide a range as the chairs in a perfect university. And, as far as might be, the committee endeavoured to assign to each subject its proportional share of attention. About half the course was commonly devoted to natural sciences, or applied arts; the other half being open to general literature, æsthetics, or social and mental philosophy. If any one thought that, in this division, literature usurped too large a share, he should remember, first, that the ratio amongst them was virtually fixed by the members themselves; next, that natural science possessed other theatres in Sydney; literature had no place of utterance beyond the precincts of their Institution. For the encouragement of physical enquiry, and for its application to our material advancement, there were already two flourishing societies. Any new discovery in natural history, or the cognate branches of observation, would fitly be communicated to the Philosophical Society. Should practice or reflection suggest an improved method of developing their material resources, it would properly be submitted to the Society for the promotion of Horticulture and Agriculture. Imagination and the abstract reason had no similar exponent. No lecturer in Sydney need fear to be too learned for his audience. If the learning were genuine, the profounder it was, the easier it was of understanding, and the more popular. There were, indeed, three varieties of learned style, and two of them justly reprehensible. The first was that of illustration, correct perhaps in itself, and even happy, but drawn from sources unfamiliar to those for whom it was intended. This, when conscious and deliberate, was impertinent; in private life it would be called vulgarity. The practice was now happily obsolete among scholars of quoting in mixed assemblies, merely for the sake of illustration, authors whose works were not generally read. The second, less pardonable, and happily also uncommon, was an affected pedantry, the cloak of ignorance, and instrument of dishonest pretension. This style belonged to the first dawn of popular education, when knowledge still retained her aristocratic air, and awed the vulgar—it faded of itself with the advancing day. Such was the perversion or the caricature of learning; the brilliant but undeciphered scroll, dazzling with dark light; or the fantastic will-o'-the-wisp, with its aimless march through marsh and mire. But genuine learning was neither obscure nor delusive, it was rather the timely ray which guides the traveller in an unknown path. Such learning was every day more familiar with the people. It was sometimes thoughtlessly said that "the age of profound study was past; there was no time for laborious vigils and life-long researches in this lightning-winged generation; that we had no care to know what men in former days did or thought, but must get up our knowledge at railway speed, and must guide our judgments by the 'spirit of the day,' not by abstract principle: instead of poring over ponderous folios, we must run our eyes over shilling duodecimos: for philosophers and historians our teachers must be the political pamphleteer or the 'leader' of the daily papers." It would be fatal indeed, were this doctrine to prevail; fatal, not chiefly to the higher literature, but to the solid liberty and progressive intelligence of the masses. Fortunately, there was little fear that it would prevail; it was its own best refutation. It was true that the quality of our journals and periodical publications had immensely improved; that fugitive columns contained information and displayed thought often worthy of permanent record, and that the number of readers was proportionally multiplied. Whence did this arise? From the improved education of our people, and their increasing habit of observation and reflection. What was the result? The *authority* of journals, and indeed of all books, constantly declined, whilst their *influence* and *power* as rapidly advanced and penetrated the popular mind. Where would they now find that superstitious deference, that child-like and implicit faith, with which the rustic politician once regarded his newspaper? The nursery-reign of print was over; the author was no longer a magician, leading men's minds captive at will or transforming them into stocks and stones; he was deposed from his autocracy—he had resigned his sceptre and descended from his throne, but only to ascend a nobler tribune—the pulpit of a free and equal teacher of self-determined and criticising disciples. The power of a free press, like all legitimate authority, depended upon the true spirit of its readers. We were born into a clearer light than our fathers. The progress of our age was in great part our unconscious inheritance of their labours. It was not by neglecting but by understanding their work that we must complete it. Every record of human thought contained a mine of treasure which, however unsuspected by the mere bookworm, was every day increasing in value to those who knew how to extract the ore. The lecturer then proceeded to point out the special advantages afforded by regular courses of lectures by professional lecturers, in addition to those addresses of which he had been speaking, and said that, in all communities, however theoretically equal, leaders must arise. The problem of freedom was not to dispense with guides, but to select them, apart from conventional standards, by merit alone; so to select as to exclude no capable man, and deter no modest man from claiming and exercising his own privilege. There was no fear that the introduction of such lectures would abate or abash the general activity of the members. Consummate models did not repress but stimulate emulation. It was the very office of genius to light up its own flame in other breasts. This was the characteristic difference between the despot and the natural chief; the former worked for his subjects, the latter helped his brothers to work for themselves; the former enervated and enfeebled, the latter was a trumpet continually sounding to action. Another most important point which he must touch upon was the system of classes for the detailed study of the various sciences and branches of literature. These were a necessary adjunct to the lectures; the tutors to the professors of our people's University, assisting the student in his attempts to carry out that line of reading or inquiry which the lecturer could only recommend. It must be confessed that the measure of their success in this department had hitherto disappointed their expectations. Classes indeed, and some of great importance, were in active operation; but neither in range of subject, nor in other respects, did they correspond with the increasing vigour of their corporate life. He thought one great cause of this was the want of encouragement afforded to the labour of the students. If stated rewards and tests of merit, if the united attractions of honour and solid value were required by the favoured nurslings of philosophy in schools and universities, how much more by those who stole from needful rest or refreshment the hours devoted to self-culture? Something had, he hoped, already been done by the establishment of annual medals; these, however, were not sufficient for the general encouragement of the students. They required a prize more extensively attainable, and more immediately the reward of diligence. The English Society of Arts had supplied such an incentive by annual examinations. Their board of examiners embraced an extensive circle of science; its members were generally men of high distinction; and the students of every affiliated institution had a most powerful inducement to perseverance in the prospect of certificates. It had been proposed at Sydney that some scheme should be devised for opening to their members the honours and degrees of the University. No one could be more desirous than its present governors to see the University widely and extensively useful; and if he thought that such a measure could possibly prove a boon to scholars, he should be foremost to advocate it. But he was well assured that it would be equally useless to themselves, and injurious to the cause of education. Their system could not possibly form a perfect scholar. Their class-teaching was intended for those whose day was chiefly occupied in business; who could devote to study only a portion of their time. But the highest learning required absolute and unreserved abstraction from all other pursuits, and University honours were, or ought to be, tests of the highest scholastic attainment, or rather of the highest scholastic promise and capacity. If they were brought within the reach of those who could give to study but divided energies, their distinctive character was lost, and with it the benefit which they conferred, not only immediately upon their possessor, but indirectly upon the general tone of education. The true scholar would be unrewarded, degraded, discouraged, and finally disappear; the half-scholar would gain nothing and would lose his standard of emulation. Even were it possible to frame the examinations so as to include the partial with the complete student they could not so equalize their real education and mental habits. The advantages of academic learning consisted not chiefly in periodical examinations, but in the daily and hourly activity which resulted from constant catechetical teaching, and from the collision of equally matched minds. The lecturer then proceeded to speak of the importance and success of the debating society. It was from amongst its members that the Society expected a constant supply of voluntary lecturers. Besides this, as public speakers they were cultivating a talent of incalculable power, one that would, probably, greatly extend their influence, and multiply their means of working weal or woe in their generation. In free communities eloquence mounted the throne of sovereignty. She superseded the soldier's sword, the rack and dungeon of the tyrant,—but there was also danger that she might supersede the legitimate control of authority, the dictates of moral duty, and the reason of the philosopher. She might betray as well as guide; might break the despot's chain only to rivet the worse dominion of the passions; she might not only nerve virtuous courage, but tempt ignorance and vanity to fatal presumption. Let the watchword of their debating society be not dialectic skill, but earnestness of purpose. Let them avoid all flippancy of statement, all arguments calculated for their hearers' prejudices rather than expressing their own conviction; above all, speaking from surface knowledge undigested by reflection. The special enemy of the popular debater was the demon of unreality; him they could never remove whilst men were swayed by passion and prejudice. They must conquer him by calling to their aid the Spirit of Faith in Truth. And one way to invoke his aid would be the taking up of some serious and laborious study. Let them correct the intoxication of the rhetorical arena by deep and solitary draughts of thought. Let every leader in the debating class think himself doubly obliged to enter upon some solid and fruitful investigation, and never to rest until he had acquired such an insight into the principles of his science as to furnish the matter of a calm and well considered lecture. The lecturer concluded by touching on various matters of local interest, expressing a hope that they would soon be able to erect a new building sufficiently extensive to meet their growing wants. At the conclusion of the lecture a vote of thanks was accorded to Dr. Woolley, and the meeting separated.

PATENT LAW AMENDMENT ACT.

APPLICATIONS FOR PATENTS AND PROTECTION ALLOWED.

[*From Gazette, September* 25.]

Dated 20th July, 1857.

1995. Alexander Whyte, 66, Lorn-place, Dumbarton-road, Glasgow—An improved mechanical arrangement for weaving.

Dated 18th August, 1857.

2189. Hugh Pritchard Hughes, Coetmor, near Llanllechid, Carnarvon—Improvements in the construction or arrangement of a rock-boring machine.

Dated 21st August, 1857.

2225. Jules Dufau, Paris—Improvements in regulating or controlling railway and lighthouse signalling.

Dated 26th August, 1857.

2261. John Webb, Bristol—An improved hopper.

Dated 1st September, 1857.

2290. Thomas Bradford, Salford—Certain improved apparatus for washing clothes or articles of wearing apparel, which apparatus is also applicable to churning.

2292. Henry Rawson, Leicester—An improvement in machinery for combing wool and other fibres.

2294. Thomas Gray, Richmond-street, St. George's-road, Southwark, and George Joseph Gladstone, Blackwall—Improvements in apparatus for lowering and letting go ships' boats.

2295. Robinson Elliott, South Shields—Improvements in photography, by which the lensular defects of the present processes of taking photographic prints are avoided, and impressions are obtained of any size.

2296. Ephraim Taylor, Blackburn, Lancashire—Improvements in looms.

2298. Rudolph Sack, Loeben, Luetzen, Prussia—Improvements in the construction of ploughs.

Dated 2nd September, 1857.

2302. Alfred Vincent Newton, 66, Chancery-lane—Certain improvements in meters for gas and other fluids. (A communication.)

Dated 3rd September, 1857.

2304. George Frederick Parnell, Hoxton—Improvements in the construction of hooks and eyes.

2306. Thomas Jackson, Orchard-street, Portman-square—Improvements in the action of pianofortes.

2308. Perry G. Gardiner, New York—New and useful improvements in the conical coiled steel rail road cut spring, and also of new and useful machinery for preparing, coiling, and converting steel plates or bars into such springs, and for testing and measuring the length of such springs.

Dated 4th September, 1857.

2310. John Yuil Borland, Manchester—Improvements in machinery for preparing, spinning, winding, and doubling fibrous materials.

2311. Louis Moreau, Paris—Improvements in apparatus for carbonising peat wood and other combustible matters.

2312. Prosper Bernard Godet, Paris—Improvements in stereoscopes.

2313. Tony Petitjean, Hatton-garden—An improved method of obtaining aluminium and magnesium.

2314. Charles William Ramié, Camberwell—Improvements in constructing the permanent ways of railways.

2315. Jacques Alexandre Ferrier, Paris—Improvements in transparent photographic pictures and their application to stereoscopes.

2316. James Robertson, Kentish-town—Improvements in furnaces, and in the consumption or prevention of smoke.

2317. William Edward Newton, 66, Chancery-lane—An improvement applicable to rolls for rolling iron or other metals. (A communication.)

2319. James Nuttall, Silver street, and Louis Stean, Goswell-street—Improvements in fur gloves.

Dated 5th September, 1857.

2320. Uriah Scott, Camden-town—Improvements in machines for cleaning knives.

2321. Thomas Bent Wilkins, Birmingham, and Thomas Milward, Harborne, Staffordshire—Certain improvements in the combination of dies for stamping belt fastenings, and which said improvements are also applicable to the stamping of other such like articles or ornaments.

2322. Richard Johnson, Blackburn—Certain improvements in purifying and filtering water.

2323. John King, Cannon-street—Improvements in the manufacture of boots and shoes, and in machinery for that purpose. (A communication.)

2324. William Edward Newton, 66, Chancery-lane—Improvements in clocks or timekeepers. (A communication.)

2325. William Edward Newton, 66, Chancery-lane—Improvements in a composition to be employed in the preparation of pigments. (A communication.)

2326. Henry Archer, Gloucester-street, Pimlico—Improvements in envelopes.

2327. Peter Armand le Comte de Fontainemoreau, London, Paris, and Brussels—An improved timekeeper dial, showing the exact time in different countries. (A communication.)

Dated 7th September, 1857.

2328. Spilsbury Butler, Birmingham—A new or improved hearse.

2329. Peter Armand le Comte de Fontainemoreau, 4, South-street, Finsbury—Improvements in doors. (A communication.)

2330. Andrew Walker and Thomas Walker, Shotts, Lanark, N.B.—Improvements in the treatment or preparation of moulds for casting metals.

2331. Thomas Goodchild, Guildford—Improvements in stoves and fire-places.

2332. William Lewis and William Henry Lewis, New York—Improvements in plate-holders or frames for photographic cameras.

2333. William Sellers, Philadelphia, U.S.—Improvements in boring or turning mills for operating in metals or stone.

2335. Constant Jouffroy Duméry, Paris—Improvements in smoke-preventing apparatus.

2337. Louis Alexis Imbert, Trevilly, near Avallon, France—An iron straight edge holder, designed for strengthening walls, edges, or mouldings.

Dated 8th September, 1857.

2339. George John Parson, Adelphi-terrace, and Thomas Pilgrim, Bow—Improvements in the mode of generating steam in the boilers of steam engines, and in raising the temperature of steam for other uses.

2341. Benjamin Sharpe, Hanwell Park—Improvements in electric telegraph cables, and in the apparatus used for paying out such cables.

2343. James M. Miller, Washington, U.S.—Surface condenser, applicable to steam engines and other purposes.

2345. William Howard, Great Queen-street, Lincoln's-inn-fields—Improved apparatus for supplying air, medicated or pure, to persons in confined apartments, and other places requiring ventilation.

Dated 9th September, 1857.

2347. Louis Letournel, Paris—An apparatus for weighing ships' anchors.
2349. Leon Louis Honoré Bertou, 36, Rue de Hautville, Paris—Improvements in the manufacture or production of ornamental wrappers or packings for fabrics or other goods.
2351. James Eastwood, Derby, and Samuel Lloyd, jun., Wednesbury, Staffordshire—Improvements in machinery for shearing iron and other metals.

Dated 10th September, 1857.

2355. John Honeyman, jun., Glasgow—Improvements in generating steam.
2357. William Jamieson, Ashton-under-Lyne—Certain improvements in looms for weaving fabrics.
2359. Richard Houchin, 7, Bridport-place, Hoxton—An improved press for punching, stamping, and embossing, or otherwise for cutting out paper, leather, or other materials, and for fixing and closing eyelets.
2361. John Dearman Dunnicliff, Nottingham—Improvements in dividing and measuring breadths of lace and other fabrics.
2363. William Crofts, Lenton-terrace, Park Side, Nottingham—Improvements in the manufacture of various weavings in bobbin net or twist lace machinery.

Dated 11th September, 1857.

2365. Marc Antoine François Mennons, 39, Rue de l'Echiquier, Paris—An improved smoke-condensing apparatus. (A communication.)
2367. James Mills, Manchester—Certain improvements in the manufacture of "keys," "tapered pins," "split pins," and other similar articles employed in the construction of machinery.
2369. Aristide Michel Servan, Paris—Improvements in the cementation of iron combined with the manufacture of coke.
2371. Charles Lungley, Deptford Green Dockyard—Improved apparatus for directing, signalling, and indicating on board ships or vessels, or other places.

Dated 12th September, 1857.

2373. Nicolas Gustave Imbert de Laphalèque, Paris—Improvements in violins and other stringed musical instruments of a similar nature.
2375. John Butler and Joseph Pitts, Stanningley, Yorkshire—An improvement in fastening tyres on wheels for railway carriages.
2377. Isidore Charles Cloet, Ghent—Machinery or apparatus for treating and dressing rice.

Dated 14th September, 1857.

2381. Theophilus Marsh, Pond's Works, Sheffield—An improved piston. (A communication.)
2383. Alexander Gray, Glasgow—Improvements in the picking motion of power looms.
2385. John Sleddon and Joseph Marsland, Oldham—Improvements in preventing incrustation in steam boilers.

Dated 15th September, 1857.

2387. Richard Shiers, jun., Oldham—Improvements in the manufacture of velvets.
2389. John Walmsley and Thomas Howard, Accrington—Improvements in machinery or apparatus for warping, sizing, or dressing and winding on yarns or threads.
2391. Gerd Jacob Bensen, Christian-street, St. George's-in-the-East—An improvement in heating apparatus.
2393. Adrien Jules Alexis Dumoulin, Paris—Improvements in heating apparatus.

Dated 16th September, 1857.

2395. Thomas Sidebottom Adshead, Staly Bridge, Chester, and John Platt, Oldham—Certain improvements in machinery for carding cotton and other fibrous materials.
2397. Richard Wicks, 21, Phœnix-street, Somers-town—Improvements in furnaces.
2399. Abram Seward and Charles Seward, Lancaster—An improved boiler for heating and keeping up circulation in water.
2401. Alphonse René le Mire de Normandy, 67, Judd street, Brunswick square, and Edward Thornhill Simpson, Calder Soap Works, Wakefield—Improvements in the manufacture of soap.
2403. William Middleton, jun., and Thomas Tertius Chellingworth, Birmingham—Certain improvements in adjusting the sliding parts of chandeliers and gas-pendants.
2405. Robert Garrard, Loman-street, Gravel-lane, Southwark—Improvements in the manufacture of japanned straw hats.
2407. Emile Alcan, Fore-street, Aldermanbury—An improved process for refining paraffine. (A communication.)

INVENTION WITH COMPLETE SPECIFCATION FILED.

2410. John Smith Barden, Aaron Watkins, Rockwood Holmes Hinkley, and Daniel Franklin Child, United States—Certain improvements in engines for hydraulic or various other useful purposes.—17th September, 1857.

WEEKLY LIST OF PATENTS SEALED.

September 23rd.

744. Charles Askew, John Askew, and Henry Myers.
811. John Sherar.
815. Thomas Mosdell Smith and Cornelius Burke.
825. Thomas Lawes.
827. William Henry Collins.
828. Thomas Lawes.
841. Joseph William Wilson.
845. William Thomas Clark.
849. Augustus Frederick Butler.
852. James Morris.
873. Arthur Nield and Nathaniel Buckley Sutcliffe.
875. David Jack.
891. John Graham.
901. Robert Adam.
906. Henry Smith.
909. John Oliver.
916. Duncan Morrison & Samuel Lilley.
917. Edwin Maw.
933. Felix Marie Baudouin.
951. John Henry Johnson.
987. James Bird Sparke and Alfred Sparke.
990. Charles Tilston Bright.
993. Alfred Vincent Newton.
1004. Charles Frederick Bielefeld.
1039. William Edward Newton.
1052. Thomas Harrison.
1064. Louis Barnett.
1151. George Wright.
1283. William Edward Newton.
1511. William Edward Newton.
1565. George Deeley.
1669. John Henry Johnson.
1682. John Fowler, jun., and William Worby.
1684. John Fowler, jun., Robert Burton, and Thos. Clarke.
1873. Richard John Badge.
1915. William Johnson.
1930. John Chanter and David Annan.
1995. James Webster.
1983. Thomas Foxall Griffiths.
1993. William Edward Newton.
2007. Samuel Butler.
2023. Jean Jacques Bouvert and François Isidore Jean Pascal.

September 25th.

831. John Hewett.
834. Reuben Sims.
855. Emil von Lowenstein.
861. Charles Martin.
864. David Thomson.
866. Ferdinand Jossa.
869. Hippolyte Benigne Girard.
870. Louis Etienne Deplanque.
886. George Hamilton.
897. Benjamin Horatio Paul.
935. John Boure.
957. Thomas Melling.
981. Frederick Piercy & Samuel Flagg.
1006. George Edward Taylor.
1012. John Coope Haddan.
1013. John Coope Haddan.
1028. Thomas Nathaniel Pengelly and George Porter.
1047. John Ramsbottom.
1049. Peter Wicks and Thomas Goulston Ghislin.
1060. William Edward Newton.
1065. Alfred Vincent Newton.

September 29th.

904. Robert Wardell.
918. Robert Otway.
920. Rd. Archibald Brooman.
922. Wm. Hardman and James Dugdale.
928. John Smith.
932. Thomas Whitehead.
942. Charles Renshaw.
944. James Milnes and Frederick William Mowbray.
948. John Henry Johnson.
954. William Perks, junr.
964. John Slack.
974. George Pearson and Edward Jessop.
1046. Patrick McFarlane.
1078. Thomas Layzell Scowen.
1080. James Warburton.
1082. James Warburton.
1084. James Warburton.
1087. George Schaub.
1088. Edward Oldfield.
1090. Jean Marie Leonidas Caillaud.
1102. Chas. Richard Barnes.
1122. Edwin Marten.
1141. George Welch.
1187. Thomas Dickason Rotch.
1337. Thomas Lambert and Obed Wakefield.
1409. John Watson Burton and George Pye.
1420. Laurent Lethuillier.
1428. Edward Curtis Kemp.
1542. Louis Laurent Bequemic.
1749. Richard Shaw and John Robinson.
1802. Stanislas Gaudrion.
1909. John Scott Russell.
1924. William Edward Newton.
1927. Webster Woodman.
1968. Gavin Walker and James Clachan.
2012. William Edward Newton.
2075. William McKinley and Ro- Walker.
2077. John Frearson.

PATENTS ON WHICH THE STAMP DUTY OF £50 HAS BEEN PAID.

September 22nd.

2060. Robert McConnell.
2067. Joseph Boulton.
2014. George Fergusson Wilson and George Payne.

September 23rd.

2124. Christopher Nickels and James Hobson.
2143. George Collier.

September 25th.

2180. Edward John Seville.
2210. Etienne Bernot.

September 26th.

2066. Louis Cornides.
2114. John Penn.

WEEKLY LIST OF DESIGNS FOR ARTICLES OF UTILITY REGISTERED.

No. in the Register.	Date of Registration.	Title.	Proprietors' Name.	Address.
4021	Sept. 19.	Grate Back	The Derwent Foundry Company ..	Derby.
4022	,, 24.	Penholder..	Gustav Georg Anton Ludwig Michael Schelhorn	Birmingham.
4023	,, 24.	The Recoil Windguard	George Octavius Williams	Torquay.
4024	,, 24.	Smith's Registered Folding Pattern Card	John Smith and Co.	52, Long Acre.

Journal of the Society of Arts.

FRIDAY, OCTOBER 9, 1857.

MEETING OF COUNCIL.

Thursday, October 8.

The following Institution has been taken into Union since the last announcement :—

444. Leeds, Church Institute.

GUTTA PERCHA OF SURINAM.

By Professor S. Bleekrode.

In the short period of twelve years this vegetable product has taken an important place among our industrial supplies. There still remains much to be learnt respecting it. Looking to the prices at the public sales of the Dutch Commercial Company, held at Amsterdam in 1857, it is worthy of remark that there were *seven* different qualities, sold at prices varying 50 per cent. :—

Quality A......	Sold	2365 kilos.,	per ½ kilo.	81 to 83	cents*
,, AA....	,,	31330 ,,	,,	65 ,, 69	,,
,, B......	,,	75000 ,,	,,	41 ,, 48	,,
,, BB ...	,,	47500 ,,	,,	39 ,, 46	,,
,, C......	,,	46350 ,,	,,	39 ,, 51	,,
,, CC ...	,,	26800 ,,	,,	41 ,, 54	,,
,, D......	,,	5630 ,,	,,	18 ,, 0	,,
,, Offal..	,,	100 ,,	,,	10 ,, 0	,,

These were from the East Indies, the prices being nearly 20 to 30 per cent. higher than before.

The quantity of East India gutta percha imported by Dutch ships into Holland was calculated to amount—

In 1851	to	6850 florins.
1852	,,	2520 ,,
1853	,,	27000 ,,
1854	,,	38132 ,,
1855	,,	166920 ,,

The quantity collected in the Indian Archipelago, and imported into Java, was—

In 1851......	221.27 pikols,	valued at	2379 florins.
1852......	248.80 ,,	,,	6466 ,,
1853......	122.59 ,,	,,	4149 ,,
1854......	1033.81 ,,	,,	42527 ,,
1855......	5111.20 ,,	,,	187006 ,,

The pikol being 61.521 kilos.

The following is a table of the gutta percha exported from Java :—

	1851.	1852.	1853.	1854.	1855.
To	Pikols.	Pikols.	Pikols.	Pikols.	Pikols.
Holland	15	47	3.5	287.68	3799.92
America.........	29	...	...	29	135
France	...	...	4	46	712
Singapore	29	76.9	58.7	102.55	708.92
Great Britain...	...	...	...	23	3
Bremen	...	...	...	...	160
China (Macao).	...	...	...	...	11

With regard to the localities in the Eastern Archipelago where the gutta percha was collected, it appears that there were delivered—

	1851.	1852.	1853.	1854.	1855.
From	Pikols.	Pikols.	Pikols.	Pikols.	Pikols.
Sumatra (W. Coast)......	221.27	242.90	79.19	258.47	961.16
Borneo...........	...	...	43.0	314.23	2557.51
Palembang	...	...	0.4	461.11	1282.38
Riouw	...	...	...	...	310.15
Total produce	221.27	242.90	122.59	1033.81	5111.20

The reports for the year 1856 are not yet published. It was important to inquire whether there might not be found a plant in the West Indies from which milky juices could be obtained, similar to that known under the name of gutta percha, which is so much valued. There seemed to be great probability that such inquiries would be successful, because the natural family of the Sapotaceæ, to which the *Isonandra gutta* or gutta percha tree belongs, has several genera and species indigenous there. Notwithstanding this, the actual fact of the existence of such a plant was not known, which appears evident from the fact that Prof. de Vriese, one of the first botanists in Holland, advised the Dutch Government at the commencement of this year to introduce the cultivation of the Isonandra gutta into the West Indies. For this purpose a plant of the true Isonandra gutta, grown in the Botanical Gardens at Leyden, was sent over to Surinam, but could not bear the voyage.

The investigations of the English at Jamaica and British Guiana, though of high scientific and commercial value, have not resulted in discovering gutta percha. At the Paris Universal Exhibition of 1855, great opportunity was afforded for examining the colonial products, but gutta percha was not to be found. Sir W. Hooker merely says, in his report relating to Jamaica, extracted from the Transactions of the Jamaica Society of Arts, "the Achras Sapota, of which the fruit is called *Noesberry*, yields abundantly a milky substance like gutta percha; the fruit is delicious, superior in flavour to the medlar; the seeds are said to be a valuable diuretic in cases of strangury, and the bark has been employed as a substitute for cinchona."

The *Achras Sapota* L., *Sapota Achras*, Mill., is the Sapotille fruit of Surinam, or medlar of Curaçao—but our gutta percha is not extracted from this plant. The tree is commonly called Bolletrie (paardenvleesch, Dutch), but this popular name gives no information as to its true origin, for it is given to various plants, differing botanically.

The wood of the tree is so called from its resemblance in colour to horse-flesh. The milky juice is used at Surinam instead of cow's milk, and the negroes drink it diluted with water. The fresh liquor much resembles cow's milk, and the juice sent to me is of the same appearance, but this, being fermented during the voyage, has the odour of sour milk; nevertheless, the properties mentioned are not sufficient to indicate its true nature, because in the same countries is collected the *Hya-hya*, or cow-tree milk, (of the Tabernaemontana utilis), renowned for its sweet and cream-like milk, supposed to contain caoutchouc, or India-rubber, in a small proportion. The *Ducali* tree gives likewise a potable milky juice.

In the description of Guiana, published in 1770, by the Dutch Governor, T. T. Hartsinck, no mention is made of the milky juice of the Bolletrie (Boerewy, Dutch), called Boerowé by the Arrawak Indians. Mr. Hartsinck gives a full description of the tree, confirmed by recent travellers; he describes it as having a thick rough bark, containing a gum-like juice, or a bitter oil;

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* The cent is the hundredth part of the florin or gilder, which is nearly 1s. 8d.

the fruit resembles the plum, and is sweet, with a white hard kernel—the leaves are like those of the laurel, glossy, oval, and acuminated.

In the catalogue of contributions, transmitted from British Guiana to the Paris Universal Exhibition of 1855, (Georgetown, Demerara, 1855), the bullet-tree (Boerowé) is described as one of the largest trees found in the colony; the trunk is often six feet in diameter, and is destitute of branches nearly to the top; "the leaves, branches, and trunk produce a whitish milk; the fruit is of the size of a coffee berry, very delicious and resembling the sapodilla." This tree is supposed, by Sir R. Schomburgk, who mentions it in his description of British Guiana, to be a species of *Mimusops*. Sir W. Hooker has quoted the same communication in his official report on Class II. of the Paris Universal Exhibition; but he is mistaken in saying that the juice exudes from the trunk, branches, and foliage, and that the size of the fruit is that of a coffee bean. Sir W. Hooker added, that the tree called *Ducuria* resembles the bullet-tree in appearance and properties. It must be remarked, that this name is quite different from *Ducali*, a tree specially known by its milky gum, or caoutchouc.

In the *Revue Coloniale*, de Juillet à Août, 1855, it is stated, that in French Guiana will be found a tree (of the genus *Ficus*), containing a substance intermediate between caoutchouc and gutta percha.

In the first letter, written by Mr. J. A. Muller, at Paramaribo, respecting the juice sent to me, the name bullet-tree is given as that of the tree from which it was collected. Hence it was of the highest interest to decide upon the botanical species of this plant, which gives the milky juice of gutta percha.

The name of *Bolletrie* is given to the	Lucuma mammosa, Gaertn. or Mimusops, Schomb.
White bolletrie, Boerowé	Dipholis Salicifolia, Alph. D.C.
Bastard do., Towranero	Bumelia nigra, Swert.
do. do. ...	Bumelia Salicifolia, known in Jamaica by the natives as *Galimeta*.
Neeseberry, do. do. ...	Achras Sideroxylon, employed as one of the best timber-woods in Jamaica.

The *Lucuma mammosa* is, according to the report of Sir W. Hooker, the marmalade-tree, (Camaramara), remarkable for its large and delicious fruit, not unlike our pears. It hence follows that the name of mimusops could not be applicable to our bullet-tree.

As an accurate description of a plant requires the examination of the flowers, foliage, and fruit, I took care to have specimens sent to me at the first opportunity. I received, in April last, the leaves and fruit; the flowers I am still expecting. I had thus sufficient means to determine the species of the bullet-tree, besides having the assistance of my friend and colleague, the well known botanical professor, Dr. Blume. It was decided to be a new species of sapota, which has received, in honour of the first observer, Mr. Muller, at Paramaribo, the name *Sapota Mulleri*, Bl. A full description, with a drawing of the new plant, is given in the Dutch Journal,* "De Volksvlijt, uitgegeven door de vereeniging voor Volksvlijt, te Amsterdam," 1857, Nos. 6 and 7, p. 279. An illustration is given of the fruit of the Lucuma mammosa, to show the difference between the fruit of our gutta percha bullet-tree and that of the Lucuma. Several other botanical characters have led to the conclusion that our bullet-tree is not a species of Mimusops, this genus being indigenous to tropical Asia, as the sapota is to the New World. The bullet-tree, or gutta percha sapota, is very common in groups on the hilly country in Surinam, above the alluvial plains. To collect the milky juice an incision is made in the trunk, seven feet above the ground, and this is enclosed by a ring of clay, which serves at the same time as a reservoir. The juice flows out of the stratum between the liber and the alburnum in profusion; there is no necessity to cut the tree down, as was universally done at the commencement of the collection of gutta percha in the Indian Archipelago.

At Surinam the milky juice is solidified in the course of six hours; I have not observed any coagulation in the juice sent to me; there were only some small particles of coagulum in one of the bottles. Even by exposure to the air in open cups during the hot days of June and July, it was not coagulated. The solidification of the juice is really not a coagulation, as is commonly supposed, but the consequence of the evaporation of the water; when the juice, by spontaneous evaporation in small quantities is totally desiccated, the gutta percha appears as a transparent yellow gelatinous substance. By boiling and evaporating a large quantity the gutta percha is separated in a dense, brown coloured, opaque mass, not differing from the East India gutta percha except in being more pure.

The milky juice runs through the ordinary filtering paper without leaving any residue; it can be diluted with water in any proportion, and the liquid remains clear and homogeneous. The genuine juice has at 15° C., a density of 0.900; the reaction is acid, and the odour resembles that of cream; it is insipid, but not disagreeable, like diluted milk. The acidity is supposed to be due to a fermentation taking place on the voyage, because in opening the bottles the fluid was effervescent, like beer.

When exposed to a slowly increasing heat no coagulation will follow, but, as is the case with cow's milk, there is formed on the surface a white pellicle with a wrinkled appearance; this pellicle appears again as soon as it is removed. This phenomenon commences at 60° or 64° C., and continues till the boiling point of water; in short, the milky juice of gutta percha closely resembles cow's milk; it does not coagulate, but solid particles are formed as the evaporation of the water proceeds. By heating it for several hours, and adding water to supply the place of that which is evaporated, the colour begins to be changed to a yellowish tint; the ordinary brown colour of the gutta percha does not appear before total evaporation and dessication. When the evaporation of the water is carefully conducted the gutta percha is easily separated from the juice as a yellowish white substance, and there remains a turbid liquid that, after complete evaporation, becomes a brown, viscid substance.

By boiling the milky juice over a spirit-lamp, the coagulation immediately commences, the gutta percha forming a white mass, and there remaining a turbid brown liquid. The turbidity arises from small particles of gutta percha held in suspension.

The milky juice gives, when evaporated to dryness, 13.5 to 14 per cent. of brown gutta percha. Absolute alcohol, added to the milky juice, separates the gutta percha immediately as a solid mass; the separation is completed by mixing 10 volumes of the milk with six of alcohol, which causes a condensation of two volumes. The quantity of gutta percha separated in this way is 14.28 per cent. The difference probably arises from more water being separated in the former case than in the latter. The gutta percha separated by alcohol is white as snow, and opaque; the colour is not affected by exposure to the air or the sunshine, and it is only after several months that it becomes a little yellowish. The alcoholic liquor remaining after the separation of the gutta percha is acid, and there is a turbidity, which is caused by free particles of gutta percha; its colour deepens by exposure to the air, and when evaporated, it leaves a brown bitter substance, soluble in water.

Ether also immediately separates the gutta percha from the milky juice. The mass is at first gelatinous, but becomes quite solid after the volatilisation of the ether. The ethereal liquor which remains holds in solution a substance that acquires a brown colour by the action of the atmosphere.

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* A copy of this paper may be seen at the house of the Society of Arts.

It is also demonstrated that the milky juice contains a substance soluble in water, alcohol, and ether, that becomes of a brown colour by oxidation. This substance is originally not combined with the gutta percha itself, and I am of opinion that it is not a necessary constituent of it. I believe that what is called by Mr. Payen *flaviale*, or yellow resin, in the gutta percha of commerce is probably a combination of gutta percha with this substance oxidised.

It is well known how difficult it is to prepare white gutta percha, the reason being that it is nearly impossible to destroy the brown substance when it has once penetrated the molecules of gutta percha. Mr. Maschke, in the *Archiv der Pharmacie*, cxxxix, p. 31, and the *Chemisches Centralblatt*, 1857, p. 110, states that even by dissolving the gutta percha of commerce in chloroform, and precipitating it, it is difficult to produce perfect whiteness.

The colouring matter is gallic acid. Its affinity for oxygen is clearly shown by the deoxidation of gold and silver solutions; for when the genuine milky juice is mixed with a solution of chloride of gold or nitrate of silver, in a few minutes the vessel becomes covered with a metallic film of gold or silver. The reactions with acetate of lead, chloride of calcium, chloride of barium, the salts of iron, ammonia, &c., all agree in proving that gallic acid is one of the components of the milky juice, and the cause of the brown colour of the gutta percha. This brown colour is immediately produced in the milky juice by mixing it with ammonia, or by exposing it to its vapour. It is not only difficult to destroy this brown colour, but it even deepens to a blackish tint by the action of the iron of the machinery employed in the process.

Dr. Hermann Karsten, of Berlin, especially directed attention to the presence of gallic acid in the parenchymal cells and milk-ducts of plants—(*Berichte der Academie der Wissenschaften zu Berlin*, 1857, p. 71),—so that we have here only a special case of a general phenomenon. This, as I before observed, is also the cause of the brown colour of the caoutchouc or india-rubber.

Chloroform and benzole have no other effects on the milky juice than the separation of a stratum as cream. This lies upon the chloroform, which is heavier, but subsides in benzole, which is lighter; it has not been observed to coagulate.

Acetic acid separates the gutta percha, after several days, as a gelatinous mass, and there remains a nearly clear white liquid. The addition of ammonia to this produces a brown precipitate. Alcohol gives the same reactions, but without coagulating the creamy stratum.

Sulphuric acid has the same effect as on solid gutta percha, because it separates the gutta percha first from the juice. Nitric acid gives no reaction at low temperatures, but by slowly heating the fluid it becomes yellow, and turbid with yellow particles in suspension. These yellow particles are soluble in ammonia, but not in alcohol, ether, or chloroform at a low temperature.

The milky juice is not coagulated by ammonia, but the colour immediately changes to yellow or light brown; by heating to 65° C. no coagulation is observed, nor is any pellicle formed; the juice remains a long time liquid, even when all the ammonia is volatilised. When treated with ether there appear to be slight traces of a fixed oil.

The following facts show that the mass separated from the milky juice is *the true* gutta percha :—

It begins to soften at 52° C., and is at 75° perfectly plastic, and capable of being moulded into any form; after cooling, and at ordinary temperatures, the substance is like leather, very strong and tough, and takes no impression from the nail.

It is nearly insoluble in alcohol at low temperatures; by boiling it is slowly and in a small proportion dissolved, but precipitates immediately after cooling, although traces of it still remain in solution.

It is slightly soluble in ether at ordinary temperatures, but by boiling it may be entirely dissolved; after cooling it is almost totally precipitated in white flakes of the purest gutta percha, but it is almost impossible to volatilise the ether from the mass.

In chloroform it is easily dissolved; for solution in oil of turpentine and benzole a little heat is required.

Its reactions with sulphuric, nitric, and hydrochloric acids are those commonly known. Ammonia, solutions of caustic potash and soda produce no effect when the temperature is raised to 100° C.

Hence the chemical identity of the gutta percha of Surinam with that of the Indian Archipelago, or the gutta percha from *Sopota Mulleri* with that from *Isonandra gutta* is clear.

A specimen of the gutta percha of Surinam, shown at the exchange at Amsterdam, was declared to be of first-rate quality.

Another specimen was tried in the gutta percha manufactory at Amsterdam. The result was, that it was declared to be of first-rate quality, and that its strength was proved. It appears, however, that the gutta percha requires some time before it is thoroughly solid and hardened. It is very much the same as many other vegetable raw materials, which require to be seasoned by time before they can be employed for industrial purposes.

I will add a few words respecting the susceptibility to decay that has been noticed in most articles made of gutta percha, even in the coverings of submarine telegraphic wires. It was supposed that the cause was a process of oxidation or absorption of oxygen (*Journal of the Society of Arts*, 11th Sept., 1857, p. 589). I am of opinion that the oxidation cannot be the only reason, because articles which have been varnished become brittle even more rapidly. I believe that there are several causes. In the first place, the above-mentioned difference in the prices at the public sales proves clearly that there is a great variation in quality, although the gutta percha is a simple vegetable substance like amyline or gum. Not only impurities may be found, but the thorough dessication of many samples has been neglected, so that they arrive from India containing a putrid fermented liquid, with their internal mass decomposed and brittle, so that there is no reason to expect that articles manufactured from such a material can last for any length of time. In the second place, the age of the plant was, till recently, thought to be quite unimportant, but it is now ascertained that the collection of the juices requires careful management, not only with regard to the season of the year, but also as to the state of growth of the tree. In the third place, I am of opinion that some of the gutta percha of commerce is not the genuine gutta percha. I may call attention to the communication of Mr. Motley, in Sir W. Hooker's *Journal of Botany*, February, 1855, relating to the adulteration of gutta percha at Singapore. "I think," he says, "I can distinguish at least five sorts, which are probably the produce of different trees, or rather five classes of gums, and perhaps the species are many more." In the letters received by me respecting the collection of gutta percha in Sumatra, six sorts are named: Nyatoe balam (or Balam Timbago), is the best of the Isonandra gutta; then follow in an increasing rate of value *pomags*, *poelei*, *okkar ugarib*, *baganrin*, and *doeriaun*, names which are totally unknown to botanists. I conclude, also, that the causes of decay require more complete investigation, and an attention to different circumstances till now neglected.

THE AMERICAN COTTON STATEMENT.

The following is extracted from the *New York Shipping and Commercial List,* of Sept. 16:—

The comprehensive and intelligible summary of the cotton crop, for the year ending the 1st inst., renders elaborate remark unnecessary, though a cursory glance at the position of the trade may not be out of place at this juncture. Speaking in general terms, we may assert that the year has been an unusually remunerative one for planters, but a comparatively poor one for spinners. The value of the staple having been relatively higher than goods, the unprofitableness of the manufacturing interests since our last annual review can be readily accounted for. The price of cotton, however, has now reached so high a point that the consumption is materially curtailed, and the production of goods will, without doubt, continue on a comparatively limited scale, unless prices advance or the raw material experience a fall in value. One very important fact, having a significant bearing upon the cotton trade, is that within the twelvemonth under review some 30,000 looms have been stopped in Great Britain, while in the United States it is estimated that at least 12,000 or 15,000 have suspended operations; and the present low prices of goods, as compared with the raw material, are suggestive of a still further curtailment of manufacture on both sides of the Atlantic. The present supplies in the English market are understood to be unusually low, and but comparatively little is going forward from this side. Indeed, the stock is reduced to so low a figure that the shipments must necessarily continue small until the new crop shall begin to move freely. The insurrection in the British possessions in India will unquestionably operate to curtail production in that quarter, but there is some danger that the extent of that curtailment may be exaggerated. Moreover, our latest circulars from Liverpool state that buyers of manufactured goods for India were holding off, unwilling to purchase upon any terms. Many mills in Blackburn, Preston, and other towns having orders for the Asiatic market, had resolved to work on short time, while others had concluded to stop altogether. Indeed, the principal demand now is from Germany, and when the wants of that country are supplied the absence of Indian orders will be more sensibly felt. Planters, factors, and speculators doubtless discern these facts as clearly as we do, however, and they are at liberty to draw from them their own deductions. Any deductions which may be predicated on the hypothesis that the demand for the great staple is destined to outstrip the capacity of the various sources of supply for some years to come, nevertheless, we cannot but look upon as unsafe. We see that even now the high prices current on both sides of the Atlantic are starting the question whether the supply cannot be augmented by a new system of cheap labour,—a system but few removes, in fact, from the old African slave trade, at one time so odious. The bare mention of any such possibility in England ten or five years ago would have called down anathemas upon the heads of those who suggested it; but the encouragement of the Coolie labour, under a system of apprenticeship, no better if as good as the system of slavery in the Southern States, is now a popular topic, not only with the most influential journals, but of speeches from utilitarian political economists in Manchester and Liverpool. We do not pretend to say that anything practical will come of this movement, or that these suggestions will bear fruit, but it is well to note the circumstance that our best customers in Europe are alive to the fact that it will not do to rely to so great an extent upon the United States for their supplies, and that nothing which capital or ingenuity can bring about to open up new sources of supply elsewhere will be left untried. We cannot say that we have any more faith than others in the success of these expedients, yet the fact that they are resolved to make the experiment is an admonition which the cotton interest here may find it well to heed. It is true nearly all experiments which have been made—and they are numerous and costly—to raise up elsewhere a rival culture to the Southern States, have proved failures; but they are not altogether abandoned, for the British anxiety to stimulate the culture within her own dominions, or in places within her reach and control, is unabated. That stimulus may not alarm the planter, nor induce lower prices here, but the closing of British manufactories, in consequence of the dearness of the staple, is calculated to strike a blow which may be sensibly felt for a period in the pocket of the Southern planter, far more sensibly than any spasmodic demonstrations to raise cotton in Asia or Africa. As the case stands, therefore, England depends on the United States for the great staple of her most important manufacture. Of her whole import last year, nearly 80 per cent. was produced in this country. This dependence is galling, for two reasons. 1. If any interruption take place in our amicable relations, we may cut off her whole supply, which would be about equivalent to national bankruptcy. The disastrous effects of such a measure upon a country, where a very small decline in the demand for labour produces distress and starvation, can hardly be over-estimated. A very short crop in this country, also, by raising prices and checking the demand for cloth, would produce seriously bad effects. But, supposing neither of these things to be apprehended, except as remote possibilities, there is—2. The rivalry of our manufacturers, growing more troublesome every year, as science, skill, and experience enable them to reduce the cost of manufacturing cloth, while they get the raw material cheaper. Formerly, England had three great points in her favour, and one against her. She had cheap labour, cheap money, and comparatively cheap cotton. She has now only cheap labour, and the difference in her favour on that is about made up by the higher cost of the raw material. The rivalry of cloth made from Surat cotton has entirely disappeared, and we now go into the markets of the world at least on equal terms. Lowell can furnish cloth as cheap, to say the least, as Manchester, and so long as England has to look to us only for her supply of cotton of the quality she requires, and must have, in order to compete with our manufacturers, she must necessarily fall astern in the race, for it is generally regarded as a fixed fact that every year a larger quantity of cotton will be worked up in this country for foreign markets, and a less quantity, comparatively, be exported. As will be remembered, the preceding cotton year closed firmly, with but a small business doing, principally for home consumption, at 11¼c. for middling Uplands, and 11½c. for ditto Gulf. About the beginning of September, our domestic manufacturers were compelled, by the small and rapidly decreasing supply in their hands, to become active competitors with buyers for foreign markets, and throughout the whole of that month and part of October our market steadily advanced, until middlings commanded 12¾c. to 12c. In consequence of the raising of the rate of interest by the Bank of England, negotiations of foreign exchange throughout the south, especially French bills, became extremely difficult, and exporters were, meantime, doing little or nothing. Influenced by this stringency in monetary circles, our market, from the middle of October to the latter part of November, continued in a dull and inanimate condition, and a decline of about 1c. per lb. was submitted to, shippers to Liverpool and the Continent being the principal operators. About the last of November, advices were received from Liverpool to the effect that, despite the advance in the rate of interest by the Bank of England and stringency in financial circles, the cotton-market was advancing with increased business. This favourable news at once imparted a better feeling to our market, and for the next seven weeks a gradual hardening tendency was manifested, middling New Orleans having touched 13⅝cents. During the latter part of January, however, the upward tendency of prices was checked, in consequence of heavy receipts at the shipping ports and a temporary scarcity of tonnage on the berth here for Liverpool. During this period, also, we had several severe snowstorms, delaying the mails and seriously deranging business. February, however, opened with a good inquiry for export, and, as holders were disposed to meet buyers, a heavy business resulted, the sales for the week ending the 17th reaching 27,000 bales. Throughout the latter part of the month, prices steadily advanced, under the conviction that the crop was destined to be a comparatively short one, until at the beginning of March middling Orleans could not be purchased below 14⅛ cents. The high prices then ruling induced holders to offer their supplies more freely, which caused a pause, and prices slightly receded about the middle of March. Subsequently, during that month and April, however, a renewal of the speculative and export demand was experienced, and the course of prices was again upward. The month of May opened quietly. Exporters were disappointed at the course of the Liverpool market, and holders, being generally confident of a final result of the crop not exceeding 3,000,000 bales, refused to submit to any reduction in their demands. Our domestic spinners were, therefore, the chief operators, and took from 5,000 to 8,000 bales weekly. Subsequently for a period of many weeks, which brings us down to the beginning of July, prices, influenced by the small stock on sale, and the probability, day by day growing into certainty, of a small crop, continued to show a strong upward tendency, and on the 7th of July middling Orleans were quoted 15 cents,—a higher figure than had been obtained in many years before. During the remainder of the month the business was light, and exporters to the continent of Europe, together with speculators and home spinners, were the principal operators. About this period the low grades began to attract attention, and even lists of middling grades were scarcely to be had at any price. August opened very quietly. The Liverpool market had continued to advance, and 8d. was the current price for middling uplands. Under these circumstances, in connexion with trifling receipts at the South and reduced stocks all through the country, holders had matters pretty much their own way, and towards the close of the month the quotations for middling Orleans touched 16½c. The business at this high figure was very light, and confined almost entirely to local speculators and our domestic manufacturers. This cursory glance at the course of the market brings us down to the close of the year,—a year which may be pronounced the most satisfactory to the planting interests of the South of any on record. The advance, it will be seen, has been steady throughout the year, prices at the close being 40 per cent. higher than at the commencement.

COTTON CROP OF THE UNITED STATES.—STATEMENT AND TOTAL AMOUNT FOR THE YEAR ENDING AUG. 31, 1857.

Export to Foreign Ports, from September 1, 1856, to August 31, 1857.

	To Great Britain.	To France.	To North of Europe.	Other Foreign Ports.	Total.
From	Bales.	Bales.	Bales	Bales.	Bales.
New Orleans	749,485	258,163	156,450	129,619	1,293,717
Mobile	211,231	84,840	16,570	2,348	414,939
Texas	9,792	4,428	6,687	...	20,907
Florida	29,125	...	1,764	...	30,889
Savannah	138,694	3,504	5,976	10,665	158,839
Charleston	138,876	40,821	28,296	21,192	229,185
North Carolina	...	...	...	...	...
Virginia	200	...	...	...	200
Baltimore	...	...	...	...	...
Philadelphia	820	...	...	...	820
New York	145,984	21,601	28,600	808	196,993
Boston	4,663	...	1,455	...	6,118
Grand Total	1,428,870	413,357	245,798	164,632	2,252,657
Total last year	1,921,386	480,637	304,005	248,578	2,954,606
Decrease	495,516	67,280	58,207	83,946	701,949

COMPARATIVE STATEMENT OF GROWTH.

Crop of	Bales.	Crop of	Bales.
1856—7	2,939,519	1841—2	1,683,574
1855—6	3,527,845	1840—1	1,634,945
1854—5	2,847,339	1839-40	2,177,835
1853—4	2,930,027	1838—9	1,360,532
1852—3	3,262,382	1837—8	1,801,497
1851—2	3,015,029	1836—7	1,422,930
1850—1	2,355,257	1835—6	1,360,725
1849-50	2,096,706	1834—5	1,254,328
1848—9	2,728,596	1833—4	1,205,384
1847—8	2,347,634	1832—3	1,070,438
1846—7	1,778,651	1831—2	987,477
1845—6	2,100,537	1830—1	1,038,848
1844—5	2,394,503	1829-30	976,845
1843—4	2,030,409	1828—9	870,415
1842—3	2,378,875	1827—8	727,593

CROP OF SEA ISLAND COTTON.

The crop of this staple the past year (included in the general statement) was as follows:—Florida, 20,365 bales; Georgia, 9,764; and South Carolina, 15,185; total, 45,314 bales, against 44,512 in 1855-6; 40,841 in 1854-5; and 39,683 in 1852-4.

CONSUMPTION.

		Bales.	
Total crop of the United States, as before stated			2,939,519
Add—			
Stocks on hand at commencement of the year, 1st September, 1856:—			
In the Southern ports		20,014	
In the Northern ports		44,157	
			64,171
Makes a supply of			3,003,690
Deduct therefrom—			
The export to foreign ports	2,252,657		
Less, foreign included	1,161		
		2,251,466	
Stocks on hand September 1, 1857:—			
In the Southern ports	23,080		
In the Northern ports	25,678		
		49,258	
Burnt at New York and Baltimore		798	
			1,301,552
Taken for home use (bales)			702,138

QUANTITY CONSUMED BY AND IN THE HANDS OF MANUFACTURERS NORTH OF VIRGINIA.

Crop of	Bales.	Crop of	Bales.
1856—7	702,138	1840—1	297,288
1855—6	652,739	1839-40	295,193
1854—5	593,584	1838—9	276,018
1853—4	610,571	1837—8	246,063
1852—3	671,009	1836—7	222,540
1851—2	603,029	1835—6	236,733
1850—1	404,108	1834—5	216,888
1849-50	487,769	1833—4	196,413
1848—9	518,039	1832—3	194,412
1847—8	531,772	1831—2	173,800
1846—7	427,967	1830—1	182,142
1845—6	422,597	1829-30	126,512
1844—5	389,006	1828—9	104,853
1843—4	346,744	1827—8	120,593
1842—3	325,122	1826—7	103,483
1841—2	267,850		

We give a table of the amount of cotton consumed the past year in the States south and west of Virginia, and not included in the receipts at the ports. Thus:—

	1850.	1851.	1852.	1853.
	Bales.	Bales.	Bales.	Bales.
North Carolina	20,000	13,000	15,000	20,000
South Carolina	15,000	10,000	10,000	10,000
Georgia	27,000	13,000	22,000	20,000
Alabama	6,000	4,000	5,000	5,000
Tennessee	12,000	8,000	7,000	5,000
On the Ohio, &c.	27,500	12,000	16,000	30,000
Total to Sept. 1	107,500	60,000	75,000	90,000

	1854.	1855.	1856.	1857.
	Bales.	Bales.	Bales.	Bales.
North Carolina.........	20,000	10,500	22,000	25,000
South Carolina.........	12,000	10,500	15,000	17,000
Georgia	23,000	20,500	25,000	23,000
Alabama	6,000	5,500	6,500	5,000
Tennessee..................	6,000	4,000	7,000	9,000
On the Ohio, &c.	38,000	26,000	42,000	38,000
Total to Sept. 1 ..	105,000	85,000	117,500	117,000

To which if we add for the past year the stocks in the interior towns on the 1st inst. (say 2,000 bales), the quantity now detained in the interior (say 5,000 bales), and that lost on its way to market the past year, the crop as given above, received at the shipping ports, the aggregate will show as near as may be the amount raised in the United States the past season, say, in round numbers, 3,014,000 bales (after deducting 100 bales new crop received this year to the 1st inst., and some 50,000 bales retained in the interior September 1, 1856, which came forward the past season and are already added to the receipts at the ports) against in

	Bales.		Bales.
1856	3,335,000	1851	2,450,000
1855	3,178,000	1850	2,212,000
1854	3,000,000	1849	2,840,000
1853	3,360,000	1848	2,357,000
1852	3,100,000		

The whole consumption of the United States the past year to September 1, 1857, was 840,000 bales against 788,000 bales the year before.

The quantity of new cotton received at the shipping ports to the 1st of September was,—in

	Bales		Bales.
1857	100	1850	255
1856	1,800	1849	575
1855	34,079	1848	3,000
1854	1,890	1847	1,121
1853	716	1846	200
1852	5,125	1845	7,500
1851	3,200		

CONSUMPTION OF SMOKE IN MARINE BOILERS.

Some time ago the Steam Collieries Association of Newcastle offered a premium of £500, for the best method of preventing smoke during the combustion of coal in marine engine boilers, and they appointed Messrs. W. G. Armstrong and J. A. Longridge, civil engineers, and Dr. Richardson, professor of chemistry, to perform the requisite experiments preliminary to the award. These gentlemen have not yet arrived at a final conclusion on the matter submitted to them; but they have recently presented their first report, of which the following is a copy:—

To the Steam Collieries' Association, Newcastle-upon-Tyne.

GENTLEMEN,—1. The length of time that has elapsed since you confided to us the task of awarding the premium of £500, which you offered in 1855 for the best method of preventing smoke during the combustion of the coal of your district in marine engine boilers, has been so great, that we feel called upon to address you on the subject, although we are not yet in a position to report finally thereon.

2. The experiments which it was necessary to make, required much time, as well as the construction of apparatus specially destined for the purpose; and at a very early period we became convinced that the only way in which we could satisfactorily decide the question referred to us, was to submit the designs brought before us, or such of them as we thought suitable, to trial on a boiler of the ordinary construction employed in steam vessels.

3. Our first step, therefore, was to have such a boiler built; then to ascertain its effective power as a standard whereto to refer the effects of the various smoke preventing systems; and, finally, by a comparison of these results with such standard, to determine how far any of them, and if any, which of them, were entitled to the premium.

4. We much regret that we are still unable to come to a final conclusion on this matter, but as in the course of our experiments we have arrived at some facts which we think it important to your interests to be made known, we beg to lay them before you, reserving for the future, and we trust not a distant, period a more complete report upon the whole subject.

5. The results obtained establish the following facts:—

1st. That the coal from your district, commonly called the "Hartleys," may be consumed in ordinary multitubular marine boilers without making any smoke.

2nd. That this may be done without the adoption of any of the various schemes which have been brought before us.

3rd. That it does not involve any loss of power or economy, but that with a given boiler *more* water may be evaporated, whilst no smoke is made, than can be evaporated with the hardest firing on the usual system accompanied by a dense black smoke; and further, that the economic effect or the quantity of water evaporated by 1lb. of coal, is greater when no smoke is being made to the extent of from 17 to 22 per cent.

4th. That the combustion of the coal is perfect, and its evaporative power far beyond what has usually been ascribed to it.

6. The first two statements are proved by the evidence of the senses, and we can appeal to numerous eye-witnesses of the operations at Elswick for their confirmation.

7. The third and fourth are proved by the results of the experiments, which may be thus stated:—

FIRST SERIES.

WORK DONE.	Hard Firing. Much Smoke.	Hard Firing. No Smoke.
Coal burned per square foot of fire grate per hour...	18·50 lbs.	21 lbs.
Water evaporated from 60° Fah. per square foot of fire grate per hour...	2·197 cub. ft.	2·932 cub. ft.
Total evaporation per hour from 60° Fah............	60·5 cub. ft.	83·5 cub. ft.
Water evaporated from 212° Fah. by 1lb. of coal	8·61 lbs.	10·10 lbs.

Shewing an increase of work done of 38 per cent., and a superior economy of fuel of 17 per cent. whilst making no smoke.

8. In the above series of experiments we had

Area of fire grate .... 28½ square feet.
Heating surface (total) .... 749 square feet.
Ratio of fire grate to heating surface... 1 to 26¼.

9. After this, an alteration was made in the boiler. The fire grate was reduced, and an apparatus attached, by means of which the feed water was partially heated by the waste gases of the chimney, making the proportion as follows:—

Area of fire grate .... 19¼ square feet.
Heating surface boiler ... 749 square feet
Heater........................ 320 ,, ,,
1069 ,, ,,
Ratio of fire grate to heating surface... 1 to 55½.

10. The following table gives the results:—

SECOND SERIES.

WORK DONE.	Hard Firing. Much Smoke.	Hard Firing. No Smoke.
Coal burned per square foot of fire grate per hour ...	21 ℔s.	17·34 ℔s.
Water evaporated from 60° Fah. per square foot of fire grate per hour...	2·909 cub. ft.	2·937 cub. ft.
Total evaporation per hour from 60° Fah.............	56 cub. ft.	56½ cub. ft.
Water evaporated from 212° Fah. by 1℔. of coal	10·06 ℔s.	12·27 ℔s.

Shewing an increase of work of 1 per cent. and a superior economy of fuel of 22 per cent. whilst making no smoke.

11. We have, therefore, no hesitation in saying, that the coals known as "Hartleys" may be consumed in ordinary multitubular marine boilers without smoke, and with a large saving of fuel resulting from its prevention.

12. The evaporative power of the coal, as above stated, is much beyond what is usually attributed to it, and this will doubtless be the more gratifying to you, as it may serve to correct an error of opinion which has resulted from the published "Reports on Coals suited to the Steam Navy," with the high sanction of the names of Sir H. de la Beche and Dr. Lyon Playfair.

13. In these reports the evaporative power of the coal under consideration, is stated at 7·495lbs. of water evaporated from 212° Fah. by 1lb. of coal, and of the Welsh coals, on an average of 31 kinds, at 9·24lbs. of water per lb. of coal—the best of the Welsh coal being 10·371lbs. per lb. of coal.

14. Some part of the great difference between these and our own results may doubtless be attributable to the different circumstances under which the coals were tried, but, we submit, that the results we have arrived at, (the experiments being made with a boiler of the ordinary multitubular construction, as generally used for marine engines,) are, as *practical data*, superior to those made by the Government Officials on a much smaller scale, and with an apparatus such as is never used for marine purposes.

15. We were not, indeed, called upon to pronounce upon the comparative values of the Welsh and North Country coals, but seeing the startling discrepancy between our results and those of the Government experiments, amounting to no less than 65 per cent. as regards your coals, we have felt it necessary to make actual trial of the Welsh coal in the same boiler.

16. These experiments are still in progress, and in our next report, we hope to give the details, and to discuss fully the whole question.

17. We are at present, however, able to state, that under the most favourable conditions, the Welsh coal does not exceed the Hartleys either in the amount of work done in a given time, or in economy, and under the general circumstances of steam navigation, falls short in both particulars.

18. It will give us great pleasure, if in our next report we are able to announce a still higher evaporative power in the North Country coals, resulting from some one or more of the plans for smoke prevention submitted to us; but it is only right to state that from the analysis of the gases escaping from the chimney during the above recorded experiments, we can scarcely anticipate any considerable increase of calorific effect beyond what we have already obtained.—We have the honour to be, Gentlemen, your most obedient Servants,

JAMES A. LONGRIDGE.
17, Fluyder-street, Westminster.
W. G. ARMSTRONG,
Newcastle-upon-Tyne.
THOMAS RICHARDSON,
Newcastle-upon-Tyne.

Newcastle-upon-Tyne, 25th August, 1857.

LISSAJOUS' ACOUSTIC EXPERIMENTS.

The following is an abstract of a lecture given at the Royal Institution by Professor John Tyndall, F.R.S. :—

The professor briefly noticed the physical cause of musical sound; referring to the bell, the tuning fork, the tended string, &c., as sources of vibration. The propagation of impulses through the atmosphere to the tympanum was illustrated by causing a brass rod to vibrate longitudinally; a disk was fixed to the end of the rod perpendicular to its length, and this disk, being held several feet above a surface of stretched paper on which sand was strewn, communicated its motion through the air to the paper, and produced a complex nodal figure of great beauty. Optical means had been resorted to by Dr. Young, and more especially by Mr. Wheatstone, in the study of vibratory movements. M. Lissajous had extended and systematised the principle; and had exhibited his experiments before the Société d'Encouragement, and more recently before the Emperor of the French. When he became acquainted with the speaker's intention to introduce these experiments at the Royal Institution, he, in the most obliging manner, offered to come to London and make them himself. This offer was accepted, and the speaker also congratulated the audience on the presence of M. Duboscq, who took charge of his own electric lamp; this being the source of light made use of on the occasion.

The experiments proceeded in the following order:—

1. A sheaf of light was thrown from the lamp upon a mirror held in the speaker's hand: on moving the mirror with sufficient speed the beam described a luminous ring upon the ceiling. The persistence of impressions upon the retina was thus illustrated.

2. A tuning fork had a pointed bit of copper foil attached to one of its prongs; the fork being caused to vibrate by a violin bow, the metallic point moved to and fro, and being caused to press gently upon a surface of glass coated with lamp black, the fork being held still, a fine line of a length equal to the amplitude of the vibrations was described upon the glass; but when at the same time the whole fork was drawn backwards with sufficient speed, a sinuous line was described upon the glass. The experiment was made by placing the coated glass before the lamp; having a lens in front of it, and bringing the surface of the glass to a focus on a distant screen. On drawing the fork over the surface in the manner described, the figure started forth with great beauty and precision. By causing a number of forks to pass at the same time over the coated glass, the relations of their vibrations were determined by merely counting the sinuosities. The octave, for example, had double the number of its fundamental note.

3. This was the first of the series of M. Lissajous' experiments. A tuning fork, with a metallic mirror attached to one of its prongs, was placed in front of the lamp; an intense beam of light was thrown on the mirror, and reflected back by the latter. This reflected beam was received on a small looking-glass, held in the hand of the experimenter, from which it was reflected back upon the screen. A lens being placed between the lamp and tuning fork, a sharply defined image of the orifice from which the light issued was obtained. When a violin bow was drawn across the fork, this image elongated itself to a line. By turning the mirror in the hand, the image upon the screen was resolved into a bright sinuous track, many feet in length.

4. A tuning fork was placed before the lamp, as in the last experiment. But instead of receiving the beam reflected from the mirror of the fork upon a looking-glass, it was received upon the mirror of a second fork, and reflected by the latter upon the screen. When one fork was excited by a bow, a straight line described itself upon the screen, when the other fork was subsequently excited, the figure described was that due to the

combination of the vibrations of both the forks. This is the principle of the entire series of experiments now to be referred to.

When a single fork vibrates, the image which it casts upon the screen is elongated in a direction parallel to the prong of the fork. In order to have the vibrations rectangular, one fork stood upright, the other was fixed horizontally, in a vertical stand, in the following experiments.

5. Two forks, in perfect unison with each other, were placed in the positions described, and caused to vibrate simultaneously. If both forks passed their position of equilibrium at the same instant, that is, if there was no difference of phase, the figure described was a straight line. When the difference of phase amounted to one-fourth, the figure was a circle: between these it was an ellipse. The perfect unison of the two forks was proved by the immobility of the figure upon the screen. On loading one of them with a little weight, the figure no longer remained fixed, but passed from the straight line through the ellipse to a circle, thence back through the ellipse to a straight line. So slight is the departure from unison which may be thus rendered visible, that M. Lissajous states that it would be possible to make evident to a deaf person a discrepancy of one vibration in thirty thousand.

6. Two forks, one of which gave the octave of the other, were next made use of. When there was no difference of phase, the figure described upon the screen resembled an 8. If the unison was perfect, the figure, as in the former case, was fixed; but when the unison was disturbed, the figure passed through the changes corresponding to all possible differences of phase. The loops of the 8 became distorted, formed by superposition a single parabola, opened out again, became again symmetrical, and so on.

7. The fifth of the octave, the major third, and other combinations succeeded, the figures becoming more and more complex as the departure from simple relations between the vibrations increased.

8. Finally, two forks which, when sounded together, gave audible beats, were placed both upright upon the table. The beam reflected from the mirror of one was received upon that of the other, and reflected upon the screen. When both forks were sounded, they sometimes conspired to elongate the image; sometimes they opposed each other, and thus a series of elongations and shortenings addressed the eye at exactly the same intervals in which the beats addressed the ear.

At the conclusion of this beautiful series of experiments, which, thanks to the skill of those who performed them, were all successful, on the motion of Mr. Faraday, the thanks of the meeting were unanimously voted to MM. Lissajous and Duboscq, and communicated to those gentlemen by his Grace the Duke of Northumberland, President.

THE ATLANTIC TELEGRAPH.

The following are extracts from a letter written by Professor Morse, who was on board the *Niagara* at the time the accident with the Atlantic cable occurred. He says:—

"At 3.45 in the morning, lat. 52 deg. 30 m., long. 17 deg. 30 m., Mr. Bright, the engineer, went on deck; our ship was going at the rate of four miles two fathoms per hour, and the cable running out at a greater speed, perhaps at the rate of five miles an hour. Mr. Bright spoke to the man in charge of the brakes, asking him what strain was upon the cable, to which the answer was returned, about "3,000 pounds." Mr. Bright directed him to put a 100 pounds more of force upon the brakes, to check the speed of the cable. This was demurred to by the man for a moment, who expressed a fear that it would not be prudent. Mr. Bright, however, persevered in his orders. The brakes were applied with the additional force, which suddenly stopped the wheels of the paying-out apparatus, and of course brought the force of the unchecked speed of the ship as an addition to the strain. At this time, too, there was a moderately heavy sea, which caused the ship's stern to rise several feet, and to fall to the same degree; when the stern fell, the cable, under its immense strain, went down into the water easily and quickly, but when the stern was lifted by the irresistible power of the succeeding wave, the force exerted upon the cable, under such circumstances, would have parted a cable of four times the strength. Hence it is no wonder that our cable, subjected to such a tremendous and unnatural strain, should snap like a pack-thread. It did snap, and in an instant the whole course and plan of our future proceedings were of necessity changed. How many visions of wealth, of fame, and of pleasure were dependent for their realisation on the integrity of that little nerve-thread, spinning out like a spider's web from the stern of our noble ship, and (in view of the mighty force of steam, and waves, and winds, and mechanism, brought to bear upon it) quite as frail! Yet, with all its frailness, nothing could exceed the beauty of its quiet passage to its ocean bed, from the moment we had joined it to the shore end until the fatal mistake of Mr. Bright, which caused the breaking of it asunder. The effect on ship-board was very striking. It parted just before daylight. All hands rushed to the deck, but there was no confusion; the telegraph machinery had stopped; the men gathered in mournful groups, and their tones were as sad, and voices as low, as if a death had occurred on board. I believe there was not a man in the ship who did not feel really as melancholy as if a comrade had been lost overboard."

Professor Morse makes another important statement in regard to the cable. He says:—

"We got an electric current through till the moment of parting, so that the electric connection was perfect; and yet the further we paid out the feebler were the currents, indicating a difficulty, which, however, I do not consider serious, while it is of a nature to require attentive investigation."

GOLD IN BRITISH GUIANA.

The *Royal Gazette* of Demerara, of the 8th September, has the following information respecting the recent gold discoveries:—

"A commission, consisting of the Hon. Dr. Blair, Sir W. H. Holmes, Mr. W. H. Campbell, and Mr. M'Clintock, have proceeded on a tour of exploration through the interior, with the view of reaching the gold mines on the river Yuruari. The three first named gentlemen started from George Town in the revenue schooner Pheasant, and proceeded to the river Waini, up which they ascended to the place of rendezvous, where they met Mr. M'Clintock and a strong party of Indian guides. Some Indians who came to George Town on Friday last brought intelligence that the party intended to start on the following day on their journey up the river. The commissioners purpose ascending the Waini until they come to the Barama, up which they will proceed in their bateaux to its source. From that point they will strike across the country to the Cuyuni, and then track up that stream to the confluence of the Yuruari. They will ascend the latter river until they come to Tupuquen, the site of the gold mines. They are expected to return in about six weeks. A gentleman arrived in the city last week from Venezuela, bringing with him about 15 oz. of gold. He had visited the mines, and represents the gold to be abundant, and the mining operations as being carried on in the most primitive fashion."

SOUTH KENSINGTON MUSEUM.

During the week ending 3rd October, 1857, the visitors have been as follows:—On Monday, Tuesday, and Saturday (free days), 4,227; on Monday and Tuesday (free evenings), 6,749. On the three students' days (admission to the public 6d.), 704; one students' evening, Wednesday, 173. Total, 11,853.

Home Correspondence.

THE DECIMAL QUESTION.

SIR,—The style, tone, and temper of Mr. Miller's letter in your *Journal* of Friday last, are alone sufficient to prove the badness of his cause and his own consciousness of defeat. Personalities are weak substitutes for argument, and abusive language never fails to recoil upon its author. Your readers will do me and my cause the justice to recollect that, in spite of gross and continued provocation on the part of Mr. Miller, I have sedulously refrained from prejudicing my arguments or lowering myself by the use of injurious words. Entirely satisfied of the justice of my views, and feeling no inclination for throwing dirt, I have had no temptation to indulge in personal vituperation.

I do not in the least admit the correctness of the unsupported assertions which constitute the substance of all in Mr. Miller's letter that has any reference to the question at issue. But at a distance from London, and without the present means of referring to parliamentary and other documents, I wish now merely to request of such of your readers as take an interest in the subject, that they will re-peruse the correspondence between Mr. Miller and myself. They will find that he has in no case fairly met any of the principal points in discussion, and that when he has not absolutely evaded all allusion to the facts, or slurred them over with an equivocal form of expression, he has endeavoured to set them aside either by palpable mystification or by assertion without proof. The violence of his personal attacks, not only on myself, but on all who presume to differ from him, whether known or unknown, speaks for itself, and amply justifies my caution in not furnishing him with additional names on which to vent what he mildly terms his "reproaches."

I am, &c.,
JOHN EDWARD GRAY.

Liverpool, Oct. 5, 1857.

THE DECIMAL QUESTION.

SIR,—I have been more amused than edified by the keen encounter of wit between the able representatives of the Bank of England and British Museum on this subject, although their controversy applies rather to bullion accounts on a large scale than to the comparatively petty daily pecuniary transactions of life and business.

This latter object is what I, in common with the great body of the public, wish should be satisfactorily elucidated, and I therefore trust that Mr. Miller will exercise his apparently well-practised pen in answering and refuting Lord Overstone's category of fifty objections to the proposed change of system. His Lordship has thrown down his gauntlet; it rests with Mr. Miller to pick it up and wage the battle. May Mammon send him a good deliverance, so says

Yours, &c., F. R. S.

Athenæum Club, Oct. 5, 1857.

Proceedings of Institutions.

ABERDEEN.—The thirty-first annual report of the Mechanics' Institution states that the department which used to claim primary notice—the classes—is now under other management. The reasons for this change were submitted to a meeting of the life members, and were, briefly, that negotiations were then in progress for the establishment of a navigation and trade school, in connection with the Department of Science and Art. The trade school would embrace day and evening classes for the branches taught at the evening classes of the Institution, and certain privileges would be reserved for the life members in place of those which they had hitherto possessed. The navigation classes have been opened, but the arrangements for the trade day classes could not be carried out till too late in the season for opening them with any prospect of success. In the beginning of January, a commencement was made with the Trade Evening School, by the opening of classes for arithmetic and writing, under the charge of Mr. William Molison, the former teacher of these branches at the Institution. The school has been very successful, and will be continued throughout the year. It will devolve upon the committee for next year to take early measures for fully organising the school, so that it may be opened after the vacation. The navigation school has been commenced with every prospect of success. Though under the management of the Council of the Schools of Science and Art, and Navigation and Trade, the connection with the Institution is such as to give the Committee a considerable interest in its prosperity. The shipowners of Aberdeen, in a very prompt and liberal manner, provided the funds necessary to furnish the school, and set it in operation; and a very efficient teacher was sent to Aberdeen by the Board of Trade. The classes for science, and the numbers who entered them last session, were as follows:—Mathematics—1st class, Mr. D. Maver, 34; mathematics—2nd class, Mr. D. Maver, 13; natural philosophy—Rev. J. C. Brown, 14; chemistry—Mr. J. S. Brazier, F.C.S., 55; total, 116. For the preceding session the number was 117. Examination exercises for the classes were sent from the Department, and the answers were forwarded by the next post after the examination. In the chemistry class three prizes were awarded, and the same number in the advanced class in mathematics. In the junior class in mathematics one prize was awarded. In the natural philosophy class no prizes have been awarded. The art school has made continued progress during the year. The works of the students, instead of being sent to London for competition and exhibition, are now examined annually in Aberdeen, by an inspector sent from the Department. The first examination took place in the end of May last year, when the inspector expressed himself highly pleased with the state of the schools, and awarded several prizes. Some of the prize-holders were considered as of such merit as to entitle them to be forwarded to the Department, and entered into competition for the national silver medal. Though none of these have been successful, the committee have learned with pleasure that a drawing in the stage of coloured ornament design, sent by John Menzies, house-carpenter, in competition for a pupil teachership, has obtained one of the three of the national medals awarded in that stage. In the library very little change has taken place. The quarterly average of readers has been 299, being two more than for the preceding year. Of free readers, being life members or their nominees, the quarterly average has been 36, being the same as for the preceding year. The issues of books for the year, compared with those of the preceding year, have been as follow:—

	From the General Library.	From the Reading Society.	Totals.
For the year 1855-56	7,608	1,675	9,283
,, ,, 1856-57	7,958	1,631	9,589
Increase...	350	—	306
Decrease...	—	44	—

There have been several donations to the general library during the year. The Committee having taken under their consideration the extent and variety of the property belonging to and in the charge of the Institution, together with the multifarious nature of the duties now requiring to be performed by the several officers, and the many inconveniences resulting from having these divided, came to the conclusion, that it had become necessary, and would be attended with many advantages, to have the whole placed in the hands of one officer. They accordingly resolved to recommend to the members that a resident manager be appointed, who should have the charge of the whole of the property, and devote his time exclusively to the business of the Institution, and the Schools of Art, Science, Navigation, and Trade. In reference to the financial affairs of the Institution, the Committee have much pleasure in presenting a favourable statement, showing a balance in favour of the Institution of nearly £56.

Pimlico.—The winter session of the Literary and Scientific Institution commenced on Monday, October 5, when Mr. Arthur B. Thompson delivered an address, to a large audience, on "William Caxton, and what he has done for us." The lecturer was listened to with great attention, and his reception showed the interest taken by the members in the subject of his address.

PATENT LAW AMENDMENT ACT.

APPLICATIONS FOR PATENTS AND PROTECTION ALLOWED.

[*From Gazette, October 2.*]

Dated 16th June, 1857.

1578. William Smith, 10, Salisbury-street, Adelphi—Improvements in steam generators. (A communication.)

Dated 21th July, 1857.

2030. Thomas Williams, Aberdaron, Carnarvon—An improvement in the construction of ships or vessels whereby their draught may be regulated.

Dated 4th September, 1857.

2318. Archibald Turner, Leicester—Improvements in the manufacture of elastic fabrics.

Dated 7th September, 1857.

2334. Benjamin Parker, Hammersmith—A new elastic composition for coating, cementing, bedding, and otherwise protecting bodies, also applicable to the construction or formation of articles to which it may be suitable.

Dated 8th September, 1857.

2338. George Josiah Mackelcan, 4, Falcon-street, Falcon-square—Improvements in floating docks.
2342. John Marland, Fernlee-vale, Saddleworth—An improvement in the manufacture of cop tubes.
2344. William Geach, Prospect-place, Old Bailey, Falmouth—Improvements in machinery for propelling vessels.

Dated 9th September, 1857.

2346. Stanislas Hoga, 72, Charlotte street, Fitzroy-square—Improvements in apparatus for generating electricity, and for transmitting electric currents from place to place.
2348. Alexander Hédiard and Sénateur Levieux, Paris—An improved boiler for generating steam.
2350. Edward Lavender, 30, Aston-street, Limehouse—An improvement in distilling products from coal.
2352. Joshua Butters Bacon, 28, Brunswick-square—Improvements in machinery for manufacturing horse-shoe nails. (A communication.)

Dated 10th September, 1857.

2356. Marin Joseph Alphonse Mille, and François Canal, Paris—Improvements in producing gas.
2358. James Fenton, Low-moor, William Thomson, junr., Wakefield, and Thomas Snowdon, Middlesboro'-on-Tees, Yorkshire—Improvements in the permanent way of railways.
2360. William Clark, Chancery-lane—Improvements in Jacquard apparatus, and in the pattern surfaces of such apparatus. (A communication.)
2362. James Harrison, 4, Red Lion-square—Improvements in apparatus for producing cold by the evaporation of volatile liquids in vacuo.
2364. Gustav Bruninghaus, Dortmund, Prussia—Improvements in the treatment of iron ore (crude iron) for the production of iron and steel.

Dated 11th September, 1857.

2366. Thomas Silver, Philadelphia, U.S.—A machinery or apparatus for regulating or governing the paying out or delivery and the laying down of submarine or oceanic telegraph cable, parts of which are also applicable for taking and recording soundings, and for other purposes.
2370. Simeon Colbeck and William Henry Colbeck, Batley, Yorkshire—Improvements in looms.

Dated 12th September, 1857.

2372. Nicholas Fisher, Milton, Northamptonshire—Improvements in machinery, combining operations in preparing land for agricultural purposes.
2374. Charles Watson, 27, Alfred-place, Bedford-square—An improved apparatus for curing certain bodily complaints.
2376. John Edwards, 77, Aldermanbury—Improvements in railways to facilitate locomotive engines ascending inclines.
2378. James Leeming, Bradford—Improvements in looms for weaving.

Dated 14th September, 1857.

2382. William Jenkins, Miles Platting, Manchester—Improvements in the furnaces or fire boxes for locomotive boilers to adapt them for the consumption of coal and the smoke arising therefrom.
2384. David Thorpe Lee, Birmingham—A new or improved washing machine.

Dated 15th September, 1857.

2386. Alexander Gray, Glasgow—Improvements in lubricating mechanism.
2388. John Ashby, Croydon—Machinery for cleaning wheat and other grain or seed from smut and other injurious matters.
2390. Thomas Grahame, Leamington—Improvements in grinding corn, and in generating gas on inland waters.
2394. Thomas Robson, 15, Critchill-place, Hoxton—Improvements in washing machines.

Dated 16th September, 1857.

2396. Prosper Bernard Godet, Paris—A new mode of illustrating literary productions.
2400. Charles William Lancaster, New Bond-street—An improvement in breech-loading guns and in projectiles for the same. (A communication.)
2404. Richard Brown, Glasgow—Improvements in moulding or shaping metals and other materials.
2406. Peter Armand le Comte de Fontainemoreau, London, Paris and Brussels—An improved railway brake. (A communication.)

Dated 17th September, 1857.

2408. Johan Ernst Fridrich Luedeke, Birmingham—A new or improved motive-power engine.
2412. George Frederick Hack, Hackney—An improved cigar tube or holder for smoking cigars or tobacco.

Dated 18th September, 1857.

2414. William Smith, 10, Salisbury-street, Adelphi—A novel machine or apparatus for engraving the metallic surfaces of printing rollers or cylinders. (A communication.)
2416. John Webb, Bristol—An improved chaff cutter.
2418. Robert Watson Savage, St. James's-square—An improved spring and appliances (for carriages and vehicles), which can also be adapted to use on shipboard, or otherwise to maintain the equilibrium of articles placed on a platform provided with the said improved spring and appliances.
2420. Charlotte Delevante, Kimbolton-place, Brompton—Improvements in bouquet holders.
2422. Samuel Faulkner, Manchester—Certain improvements in machinery or apparatus for carding cotton and other fibrous substances.
2424. Richard Watson, Galashiels—Improvements in the manufacture of heddles or healds for weaving.
2430. Thomas Webster, 13, Place du Havre, Paris—Improvements in the permanent way of railways. (A communication.)
2432. Henry Bessemer, Queen street-place, New Cannon-street—Improvements in the manufacture of cast steel.

WEEKLY LIST OF PATENTS SEALED.

October 2nd.

927. Rd. Archibald Brooman.
939. Elkan Adler and Francis Barber Howell.
966. Charles Goodyear.
972. James George Hunt.
976. John Robinson.
980. Henry Brierly.
1000. Thomas Rolfe.
1072. John Sudbury and Alfred William Linsell.
1114. William Edward Newton.
1134. Robert Taylor, Rd. Worswick, and John Lovatt.
1176. William Pickstone.
1180. Charles Cowper.
1226. James Anderson.
1290. Richard Bennett.
1296. William Smith.
2002. William Edward Newton.
2062. John Clay.

October 6th.

973. John Talbot Pitman.
977. Edward Finch.
984. Robert Kanzow Bowley.
985. Benjamin Hingley and Samuel Hingley.
989. Edmund Edwards and Edward Beacher.
992. Jasper Wheeler Rogers.
1003. Edwin Powley Alexander.
1010. John Leach.
1011. John Beech and John Williams.
1036. Thos. Richardson and Edm. John Jasper Browell.
1068. James Payne.
1081. Johnson Hands.
1126. James Sharples.
1128. Thomas Burton and Simeon Lord.
1189. Julien Billiard.
1330. Peter Armand le Comte de Fontainemoreau.
1615. William Edward Newton.
1686. Joseph Ellis.
1694. Jas. Heywood Whitehead.
1723. Edward Vincent Gardner.
1772. John Henry Johnson.
1862. Peter Armand le Comte de Fontainemoreau.
1953. Frederick Crace Calvert and Charles Lowe.
2015. James Hall.
2097. Thomas Rickett.
5126. Thomas Lawley.
2131. Alfred Vincent Newton.
2133. Wm. Irving Holdsworth.

Patents on which the Stamp Duty of £50 has been Paid.

September 30th.

2145. Thomas Bennett.
2228. Ernst Gessner.

October 1st.

2109. Thomas Sherriff.
2118. William Tatham.
2123. William M'Naught.

October 2nd.

2131. William Peel Gaulton.
2140. William Bridges Adams.

Journal of the Society of Arts.

FRIDAY, OCTOBER 16, 1857.

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THE WAVE LINE SYSTEM OF SHIPBUILDING.

By Thomas Moy.

The following paper was read at the recent meeting of the British Association, at Dublin:—

There are many practical men who have but a vague idea of the Wave Line System, and are ignorant of any reason why it is to be preferred; and the late Mr. Marett, of Southampton, in his clever work on Yacht Building, says of the wave line system: "I have consulted books, and attended lectures by the eminent originator of the system, but all attempts to obtain sufficient information to enable me to construct on the wave principle have been most unsuccessful;" and again, he says, "This system is founded on no theory whatever, and merely amounts to an artificial plan for obtaining tolerably good water lines, and until it has been demonstrated that they are the best that can be designed, any constructor should be unwilling to fetter himself by adopting so arbitrary a system.

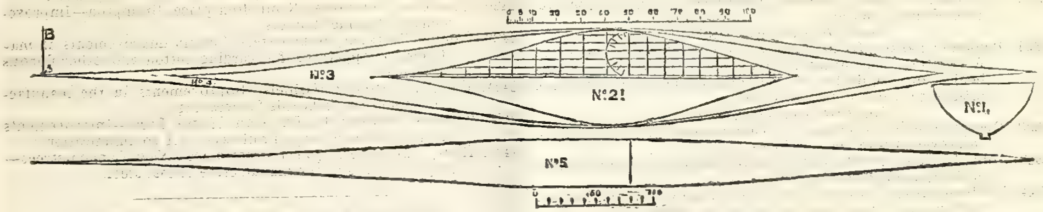
A vessel afloat divides a column of water into two parts, one on each side of the keel. If we can discover the best movement for *one atom* of one of these portions at a right angle to the motion of the vessel (from A to B,) commencing at the stem and ending at the greatest breadth, it will be sufficient for the present purpose,—that of obtaining the best form of entrance lines.

As I have a dislike to the term *resistance*, I will herein substitute the word *duty* instead.

The stems of most vessels at the load water line are formed with an angle, the more acute the angle the more the vessel is praised as being a clipper; but there should be no angle here, any angle at the stem being as detrimental to speed as the same angle would be in any other part of the entrance line, and it is as absurd to have an angle at the stem as it would be to attempt to shunt a railway locomotive from one line to another with the junction laid down at an angle instead of a curve.

The crank, in machinery, imparts to a reciprocating body connected therewith the most perfect motion that can be obtained where a reciprocating motion is required. This motion may be traced throughout creation from the motion of the planets to the smallest pendulum: every circular motion may be resolved into a reciprocating motion, and the pendulum vibrates as though controlled by a crank. This motion is also the best for water, because water is subject to the same laws as those of solid bodies in receiving and imparting motion. The best motion therefore for the atom of water from A to B is that which it would receive if connected with a crank in motion, the supposed crank arm being equal to one-fourth of the vessel's beam, and the connecting rod being infinite. The curve necessary to produce this motion is called the Wave Line, and the load water lines of the vessels Nos. 2, 3, 4, and 5, in the plan, are formed upon this curve in its integrity. Any attempt to hasten the motion of the atom of water by making any part of this line fuller than it is, will produce a decrease of speed.

Having found the best motion to be imparted to this atom of water, I will now describe the duty to be performed by the 5 vessels shewn in the drawing, and proceed to show how an increase of speed may be obtained to an almost indefinite extent.



The whole of the vessels are represented as 40 feet beam. The bows of No. 2 being 100 feet long; No. 3, 200; No. 4, 250. Suppose No. 2 of 100 feet bow to come in contact with an atom of water at its stem while going 10 miles an hour: it pushes this atom aside 20 feet in seven seconds while the vessel progresses 100 feet; and suppose it does this with 200 horse power. No. 3 has a bow 200 feet long, it pushes the atom of water aside also 20 feet in 7 seconds, while it progresses 200 feet or 20 miles an hour. No. 4, has a bow 250 feet long, and moves the atom of water also 20 feet in 7 seconds, while it progresses 250 feet in the same time or 25 miles an hour. And No. 5, with a bow 500 feet long, also moves the atom of water 20 feet in 7 seconds, while it progresses 500 feet in the same time, or 50 miles an hour. And if No. 1 moves the atom of water 20 feet in 7 seconds, it only progresses 20 feet in the same time, or 2 miles an hour; and in order to propel the latter vessel at 10 miles an hour, it would have to move the atom of water 5 times as fast as No. 5 would while the latter vessel is going 50 miles an hour; or, in other words, if No. 5 could travel at 250 miles an hour, and No. 1 at 10 miles an hour, they would both be moving this atom of water at the same speed.

And now as to the power required for each of these vessels. Suppose No. 2, with a bow 100 feet long and 200 horse power, can travel at 10 miles an hour, No. 3 has the same duty to perform with respect to the atom of water while going 20 miles an hour, but the length of her bow is double that of No. 2, therefore she must have double power, or 400 horse power. No. 4 turns the column aside in exactly the same time as the others, but in consequence of her increased length and greater duty, must have 500 horse power, and will travel 25 miles an hour; and No. 5 with 1000 horse power will travel 50 miles an hour, her bow moving the column of water aside 20 feet only in 7 seconds as before, while travelling at that high speed; while No. 1 will require 20 horse power to make her travel 2 miles an hour, her duty with respect to the column of water being as before 20 feet in 7 seconds, but the length of her bow being one-fifth of No. 2, reduces the necessary power to one fifth of No. 2.

Most men would believe me if I say that I can propel No. 1 at 10 miles an hour under steam, but would disbelieve me if I say I can propel No. 5 at 50 miles an hour; yet the latter would be easy and the former almost impossible.

I have chosen the word *duty* instead of *resistance* because I think the latter word inapplicable. I look upon the immersed side of a vessel as a wedge which has a certain duty to perform in a certain time, and think the word duty is more applicable; as we speak of steam engines doing duty, so many pounds so many feet high per minute. By lengthening the bow it has more time in which to perform its duty, and by obeying the natural laws of motion that duty is reduced to a minimum.

As to the economy of the high speeds I have mentioned: I will take, as an example, the voyage from Dover to Calais—say 20 miles. No. 1 would perform this voyage in 5 hours with an 80 horse engine, and would require 30 cwts. of coals. No. 2, with 200 horse power, would perform the same voyage in 2 hours, with the same expenditure of coals, viz. 30 cwt. To drive No. 2 over in one hour would require 800 horse power, and consequently the fuel per hour would be increased four-fold, but as the voyage would be but one hour she would expend twice the fuel in performing the voyage at twice the speed, viz., 3 tons. No. 3, however, would need only 400 horse power to enable her to perform the voyage in one hour, her expenditure of coals on the voyage being again 30 cwt. Thus No. 3, of twice the size of No. 2, can perform a voyage twice as fast as No. 2 with the same quantity of fuel. No 4, with engines of 500 horse power, would travel 25 miles an hour, and perform the voyage in 48 minutes, with the like expenditure of fuel: 30 cwt.; and No. 5 would perform the same voyage in 24 minutes, with the same 30 cwt. of coals and 1000 horse power.

In the above calculations I have omitted the item of friction, and I think I may safely do so, as, although the amount of surface increases with the size, the friction per square foot decreases with the sharper lines.

In "Dr. Lardner's Railway Economy," published in 1850, the following remarks relative to American river steamers occur: "The increase of the dimensions of these vessels has been attended with greatly augmented economy of fuel. On comparing the Hendrick Hudson with the Troy, it has been found, that when the speed of the former is reduced to an equality with the latter, the former consumed 13 tons of coal while the latter consumed 20 tons; yet the displacement of the Hendrick Hudson is nearly twice that of the Troy." Again, "The results of their performance show that the resistance per square foot of midship section is not perceptibly increased by the increased length of the vessel, and the consequently increased surface and friction. This anomaly has not been explained, but it is certain that the increased length does not diminish the effect of the moving power in any perceptible degree."

The Doctor's anomaly I have attempted to explain in this paper.

Although I have given certain dimensions to my examples, I have done so only for convenience of calculation, and do not in the least bind myself to these figures.

Lastly, a few words on experiments. I have attentively examined in the British Museum the experiments on models tried at the end of the last century, and Mr. Bland's experiments on the forms of ships and boats. I have also tried a few myself. I find that if small models are propelled at a great speed, in proportion to their size they develope the advantages of the wave system, but not at low speeds; the water requiring a very rapid oscillation to produce a satisfactory result. The reason of this is that the laws which govern the action of the pendulum govern all bodies capable of motion, and the diminutive bow of a model boat easily puts in motion a small quantity of water, without a hollow water line, at a low speed, and, unfortunately, does not furnish sufficient evidence for guiding us in the formation of large vessels. The larger the vessel is, the more important become the sharp lines, though the reverse of this has obtained hitherto, the cutter being sharp and the three-decker bluff bowed.

The three following tables are added to illustrate the subject. Table No. 1 shews the speed at which each vessel can go while the column of water is turned aside at the speed of two miles an hour. Table No. 2 shews the speed at which the column of water is turned aside while all the vessels are going 10 miles an hour. It will be noticed how the speed of the column of water decreases with the relative length of the bow. No. 1 has an immense duty to perform, No. 2 her full duty, and the rest decreasing down to a mere auxiliary amount of horse power. Table No. 3 shews the same at 50 miles an hour.

Table, No. 1.

No.	Speed in miles per hour.	Speed in feet per minute.	Speed of the atom of water in miles per hour.	Ditto in feet per minute.	Length of bow in feet.	Half beam in feet.	Proportion of half the beam to the length of bow.
1	2	176	2	176	20	20	1
2	10	880	2	176	100	20	.2
3	20	1760	2	176	200	20	.1
4	25	2200	2	176	250	20	.08
5	50	4400	2	176	500	20	.04
Great Eastern	16	1408	2	176	330	41.5	.125

Table, No. 2.

1	10	880	10	880	20	20	1
2	10	880	2	176	100	20	.2
3	10	880	1	88	200	20	.1
4	10	880	.8	70.4	250	20	.08
5	10	880	.4	35.2	500	20	.04
Great Eastern	10	880	1.1	97	330	41.5	.125

Table, No. 3.

1	50	4400	50	4400	20	20	1
2	50	4400	10	880	100	20	.2
3	50	4400	5	440	200	20	.1
4	50	4400	4	352	250	20	.08
5	50	4400	2	176	500	20	.04
Great Eastern	50	4400	6.27	552	330	41.5	.125

GOVERNMENT SCHOOLS OF ART.

The annual distribution of the national medals for drawing among the students of the Schools of Art of the United Kingdom took place in the Manchester Town-hall on Friday evening, the 9th inst., under the presidency of Earl Granville. The exhibition of the prize designs by students in all the schools of art in the kingdom had previously been opened at the Manchester School of Art. The collection comprised upwards of five hundred specimens. On the occasion of the prize distribution the principal room of the Town-hall was completely filled. Earl Granville was accompanied, as the deputation from London, by the Right Hon. W. F. Cowper, M.P., Mr. Redgrave, and Mr. Cole, C.B. On the platform were also the Bishop of Manchester, Mr. W. Dargan (of Dublin), Mr. Cheetham, M P., Mr. R. M. Philips, M.P., Mr. Joseph Whitworth, Mr. W. Fairbairn, and most of the gentlemen who have been engaged in promoting the Manchester School of Art and the Exhibition of Art Treasures.

Mr. Edmund Potter, the chairman of the committee of the Manchester School of Art, commenced the proceedings by explaining that the drawings which had obtained bronze prize medals in the schools of art all over the country were sent up to London, and that silver medals were awarded only to the best of these.

Mr. Redgrave said, Lord Granville had desired him to explain the course adopted in schools of design or schools of art, in order that the system on which the awards of that evening were made might be properly understood. When the government were urged to take up the question of instruction in art, the establishments called Schools of Design, as first instituted, were devoted exclusively to the instruction of mechanics and artisans, with a view to improve their knowledge, and thereby the manufactures of the country. But it was very soon found that this was taking a very limited view of the matter. It was necessary, if we desired to improve the public taste, that we should educate all classes, and especially the consumer, who was to purchase the articles manufactured, as well as the designer and the artisan, who were to execute them. Consequently, that instruction which had been at first rigidly confined to the artisan classes, was opened to all classes who chose to participate in it. It was discovered, almost simultaneously, that drawing, if properly taught—the elements of drawing, at least—exercised a very great influence on general education; that if we taught a boy drawing it enabled him to see better, to compare better, and to have a better sense of things altogether than he would have by the mere rote learning which had previously been in practice. He would speak a little of the general intentions of the government with regard to the education of the people in the elements of art generally. A system had been adopted by which education was now given in all schools for the poor, and so given that any town in the kingdom might avail itself of the opportunity to receive this instruction. Any town which chose to take the trouble of registering 500 students, or 1 per cent. of the population, who were willing to pay 6d. for instruction for one year in drawing, might have a master recommended who would undertake for that small sum the instruction of those 500 children for one year, giving them one lesson per week. The State further undertook to test this instruction, to see that it was soundly carried on, and at the end of the year would send an inspector down, and by means of papers, from which there was no escape, would examine those boys who chose to come up for examination. And, to induce them to come up, a small prize was given to every successful child, the prize being of materials that would assist him in the further progress of his art instruction. Moreover, to give the master an inducement, for every boy who received such a prize a small payment was made on his behalf to the master, which was in aid of the mere 6d. he had to pay for the twelvemonth's instruction. Those who might visit the exhibition of the prize drawings during the week would find, among the other works of art, a copy of the paper given to the boy by the inspector when he came to examine him. It was executed in presence of the inspector, in a given time, and by every boy at the same time. It consisted both in free hand drawing, to educate his eye to precise imitation and appreciation, and his hand to power, and also a little way in those scientific principles, such as the nature of geometry and perspective, which enabled him to see the relation of things to one another. The prizes were also submitted to the inspection of visitors, and it would be seen that although they were all of a valuable nature, and such as the boy could not very well obtain for himself, the examination papers were such as would absolutely test the progress he had made. This education, therefore, was open especially to the lower classes, and to all who chose to come up and test their powers, and see whether they were really profiting by the instruction given to them. It was open to any one else besides those who received instruction from the masters appointed by the Government, and if they succeeded they would obtain the prizes, although, if the master who instructed them was not appointed by the Government, he did not receive the reward. This formed what was called the first grade, and it was an extremely valuable part of public education, not only male but female. A bronze medal was given as a prize to all those who were most successful in these prescribed examples. These bronze medals were given at the local competition. Only 30 could be given in any school, and it must be very satisfactory to the people of Manchester to know that their school had this year the whole number of these local medals, while it was the only school throughout the kingdom that had thus distinguished itself. These drawings were again gathered together in one place—on this occasion it was in London—and two of our most eminent artists, Sir Charles Eastlake and Mr. Maclise, had assisted him (Mr. Redgrave) in making the award again upon these prize drawings, 100 national medals being permitted throughout the whole of the schools in the country, in such proportions as they might happen to fall upon the various schools. It was these national medals that were to be distributed that evening. He very much regretted that they were not able that evening to give the students the medal itself, which would be a very handsome one. In endeavouring to give them the very best work of art that could be obtained, they were obliged to go to the most eminent artists, and the artist on this occasion happened to be a foreigner. He hoped that on future occasions English art would stand well enough to produce its own medals, but on this occasion the medal would be the work of M. Vechte, whose works stood forth preeminent in the Great Exhibition in Paris, among them being that wonderful shield which was the admiration of all the civilised world, and which was now in the Manchester Exhibition. M. Vechte was engaged to give them one of the finest medals he could produce, and said he was using all his efforts to produce one of his choicest works. On this occasion each prizeholder would receive a certificate, and they would be quite satisfied with the delay when they saw how beautiful their medal would be when it was ready for distribution. He would merely add, to sum up all that was endeavouring to be done, that in addition to various aids to instruction, which were valuable to all, the Central Department in London, the Department of Science and Art, was now making efforts to render all that it possessed available and fruitful in the provinces. They had been enabled to collect a most valuable library of art, an especial library of art; and, under very simple conditions, these valuable works, far too important to be bought by individuals, and hardly likely to be bought by provincial towns even, since they were many of them rare and not often in the market—these works were lent, by a sort of circulating library process, to the various schools of art for a short period, with constant changes. Moreover, all that they got in their purchases for the museum at South Kensington was also circulated in the same way. All that was being done was not done with the view of educating artists. No doubt artists would come out of such education, but this education was given with a view to produce an intelligent appreciation of art and a right taste in matters of art. He should be pardoned for addressing one word to the number of students who were before him, and who, he knew, had all been looking at that great exhibition. He could not help saying to them that there was one striking fact observable throughout the works in that exhibition. They would say, perhaps, it was a low fact he was going to remark to them, but it was one very valuable for them to notice, and it was the amount of loving labour that there was throughout all the works in that exhibition. They could not see a first-class work anywhere that had been done without labour, and that labour not mere labour, but loving labour; and if they would achieve excellence and eminence it was only through this labour they could succeed. Not that they were to rest in labour, but that labour should wait upon the higher qualities of the artist. Let them not think they could do it slightly and easily, for it was no easy thing—it was life-long; and if they wanted to rise from mere education in the elements of art to be artists, he was quite sure they must be life-long students.

After an address from Lord Granville, the names of the prizeholders were called over by Mr. Cole, and the certificates of their claim to the medal were presented to them in succession by his lordship.

The Rt. Hon. W. F. COWPER, M.P., then addressed the meeting, which concluded by passing votes of thanks to the President of the Council and the Vice-President of the Committee on Education.

CONTINENTAL ART SCHOOLS.

In the circular intimation of the commencement of the sessional courses in Architecture and Construction at University College, on the 13th inst., Professor Donaldson says,—

"In a short visit that I have recently made to Belgium and the Rhenish Provinces of Prussia, I have been much struck with the ample provisions made by the Governments generally of those countries, and by the local municipalities, to provide the means of artistic instruction for all classes.

"An earnest and intelligent spirit of enterprise is moving all, particularly in Belgium, to perfect themselves in every branch of manufacturing productions and works of art. They are, therefore, making corresponding progress in their endeavours to equal and even to surpass other nations.

"Antwerp, Ghent, Liège, Brussels, and Dusseldorff, has each its well-appointed schools, with first-rate professors in all branches, and directors of the highest eminence. At Antwerp there are 1,300 (!!!) pupils in the Art Schools, preparing to carry the fruits of their teaching and studies into the active purposes of after life, and who are distributed throughout the various productive classes of the community; some to be devoted to the higher objects of painters, sculptors, architects, engravers, or carvers; others contributing to the embellishment and refinement of the manufacturing industries,—all tending to elevate the taste.

"I venture to call attention to these striking facts.

"Architecture, also, is there very thoroughly taught in all its branches, and young men are rising up who pursue an active, zealous training, to fit them for a future successful career."

NATIONAL ASSOCIATION FOR THE PROMOTION OF SOCIAL SCIENCE.

The inaugural meeting of this Association was held at Birmingham on Monday evening last, under the presidency of Lord Brougham. In opening the proceedings his lordship said:—

As many were here present besides the promoters of the plan, it seemed proper to set forth the views with which it had been proposed, and the advantages expected to result from its adoption. Let it not be thought that their attention was called to positions too general or too elementary. If human knowledge was divided into two great branches, the science which dealt with abstract truths, and the science which treated of real existences—matter and mind, or natural and moral science—of these the latter and most important related either to man as an individual or as a member of the community, and this or the political and social branch was most eminently deserving of attentive study. Although very few men were or could be students of mental science, the bulk of mankind were and must ever be political observers. The operations of their own minds scarcely at any time engaged their attention; but the actions of the government, the habits and proceedings of the people, the conduct of other nations, their fortunes and their fate, formed the daily subjects of reflection with persons of even an ordinary degree of intelligence in every civilised country, and did not escape the observation of those living under rulers who prohibited all open discussion. For cultivating this branch of science, too, there were manifest and peculiar facilities. The facts on which it rested were more plain and tangible than those which formed the ground of moral philosophy in its other departments. The accumulation and distribution of public wealth; the prosperity or sufferings of the people; the quiet or the disturbed state of the country; the diffusion of knowledge by education; the moral improvement of different classes; the administration of the law and its influence upon the habits of the community; the benefit which might result from individual exertions unconnected with the state; the increased efficiency of such exertions when made by bodies of men; the just limits of public interference with private concerns, whether for encouragement or repression; the duties of the state in respect to undertaking works beyond the power of individual enterprise, and the limits of those duties; the right and expediency of public interference with the authority or the conduct of parents—these were matters of distinct observation, and connected with facts so as for the most part to admit of exact calculation. When the paramount importance of moral and political science was regarded, and the facilities for its cultivation, from the nature of the evidence it rests on, were duly considered, it had struck observers whose efforts were directed towards human improvement as somewhat extraordinary that the course should not have been taken here which had proved so advantageous in assisting the progress of inquiry in that other great department of knowledge—natural philosophy; and they had strongly recommended the plan of assembling together occasionally, perhaps periodically, the various individuals and bodies whose attention was devoted to the ascertainment, illustration, and general exposition of moral and political doctrines. It was very possible that in the end this object might be attained, and that this association might bear as wide a relation to moral and political science as the British Association, which had now been in successful action for considerably more than a quarter of a century, does to mathematical and political science. At present, however, a more limited view was taken. It was proposed that five of the most important branches of moral and political inquiry should be singled out—those which especially formed the portals of social science—comprehending the plans both in their details and in the principles that should govern them for furthering the improvement and securing the stability of the social system, correcting the faults, and supplying the defects of our institutions upon sound, rational, and temperate views, and rendering desperate all attempts either to check the progress of improvement, or to gratify the wild desires of those who would destroy rather than amend; in a word, steering the middle course between those who regarded all change as pernicious, and those whom no change would satisfy. But if their subjects were in some measure limited, the scope of their deliberations was anything rather than narrow; it embraced the greatest temporal interests of mankind. In the first rank, indeed at the head of the whole, must be deservedly placed jurisprudence and the amendment of the law—jurisprudence, described by Burke as the pride of the human intellect, and with all its defects, redundancies, errors—the collected reason of ages, combining the principles of original justice with the infinite variety of human concerns. But among those redundancies and errors very many were almost of necessity the growth of time, the great innovator. Lord Bacon said that it changed, though slowly, even imperceptibly, yet surely and without any intermission, the circumstances of society; while a reluctance, grounded on a wholesome dread of rash alteration, but carried oftentimes to excess, hindered us from adapting our laws to the new state of things, and this made the retention of the old rule occasion the very shock, the very violence, which it was wished to avert, as the steersman, too anxious to avoid the stream might be stranded on its bank. It was impossible to make any arrangement of even the subordinate branches of a great subject which should keep each entirely separate from the rest, because all were so related as to run into each other. Thus the repression of crime and the reformation of offenders were intimately connected with jurisprudence, and could not be fully considered in one point of view, at least, apart from the preventive operation of the law for punishing crimes, and the provisions for detecting them; the two great departments of criminal jurisprudence, penalty and police, being the third. But much remained to be considered with respect to the prevention of offences and the reformation of offenders, entirely independent of these three branches of the criminal law. Again, there was the great subject of education; its broad foundations were connected with the department just adverted to—the preventive and reformatory system. Yet, whatever related to instruction, the planting of schools and training of teachers, the methods of instructing, the care of children, independent of imparting the kind of knowledge which was termed learning, the limits within which the State might safely act for encouraging education, the right or even the duty of the state to enforce the acquirement of good habits and useful information, while it severely punished for the certain consequences of the want of them—these important matters might be handled as a separate branch of inquiry without breaking in on the other department. Perhaps the great subject of sanitary policy stood more in a state of separation than any of those which had been mentioned, but that it was truly isolated could not be affirmed. Education had no little bearing upon some of its essential questions, the action of government upon others, police most materially upon some, and the positive laws respecting health—both those for regulating foreign commerce and those relating to the home trade—were intimately connected with several parts of the subject. It might, nevertheless, be considered that much more depended under this head upon individuals acting separately or in bodies than upon either the enactment or the execution of the law; the very important head of social economy, on the other hand, was the one most of all connected with all the sister departments; and it would not be easy to over-rate the magnitude of the several subjects which fell under this head. But it was by no means hard to point out its connection with problems the most delicate and of most difficult solution, such as those of tracing the line which separates the province of the lawgiver from that of the community and its members, and fixing the point at which the state interference ought to stop. The difficulty which had been found in endeavouring to make a logical division of the various departments of inquiry, arose from that truth, so undeniable in itself, and so happy in its consequences, the intimate connexion that subsisted amongst all the arts, the sciences, and the inquiries which touch the interests of mankind. It was manifest that they were taking a right, in some sort a necessary course in bringing together those who chiefly devote themselves to promote these inquiries, and to measures connected with social improvement; and this position appeared to rest upon most solid grounds, both from considerations common to all joint undertakings, and from the peculiar nature of the subject itself. Of the former description was the great advantage which must accrue from the mutual help afforded to one another as fellow-labourers in the same cause; the increased efficacy thus given to the efforts of each; the lights struck out by full discussion, with the valuable suggestions thus produced—the experience, the reflections of each individual being made as it were common to all; the security against error by timely examination of each plan before its author's prepossessions had been too deeply rooted, and before he had been committed to its details; the authority given to proposals ultimately and after mature deliberation persevered in, even if not sanctioned by the consent of others; the influence which might be acquired in various ways when that sanction had been declared. These advantages attended all such unions, and might be cited in favour of any combined operations, whatever was the nature of the subject. But there was a peculiar expediency—it might rather be said necessity—for such a common or united action when a great variety of opinion was likely to exist upon matters, possibly no universal concurrence upon all the particulars of any one. Placing all prejudices arising from diversity of political party or religious sect entirely out of view, and assuming every person to be inspired with the pure and single desire of performing his duty towards the community, it was still unavoidable that men should view the same subject in different lights, and that the absence of such standards from demonstration or experiment, as the reasoners on other sciences could appeal to, should create doubts and introduce diversities of opinion. In some cases these differences would yield to full discussion, but in not a few instances they would remain; and here was precisely the inestimable advantage of such a union as theirs. That discussion and explanation might often remove the grounds of dissent was undeniable; but it might often happen that, after all, the difference of opinion would continue; and there were no doubt subjects that involved principles on which men of great sagacity and good information might conscientiously take different, even opposite views. Thus it was of incalculable importance that those points upon which they were agreed should be separated from the rest, and the measures approved regarding which no material difference existed, or (which was only another form of the same proposition,) the measures be so modified by mutual concession on the controverted grounds, as that what all approved should be adopted. Such a wise and most useful proceeding implied no abandonment of principle, because nothing was more common than the instance of the same practical course being with entire consistency pursued, whichever of two conflicting doctrines might be held the sounder. Upon the beneficial effects of united action in its different applications he could venture to speak from an experience of some duration and considerably varied. His lordship then proceeded to enlarge upon the advantages which had resulted from combination in the case of the Society for the Diffusion of Useful Knowledge, and that for Promoting the Amendment of the Law, and then referred to the recent educational conference in London. Returning to the subject of the present association, he went on to say, that some of their inquiries no doubt regarded subjects which did not fall within the province either of those who made or those who administered the laws. Among others, some in which interference would be hurtful, whether of government or of parliament, now, but in other cases where there could not, and where there should not, be such action, their labours might be supplemental to the state. But when they were only ancillary, when by preparing measures, by explaining them, by recommending them to the community, or it might be by stimulating the legislature to adopt them; far from any jealousy of their exertions being reasonably entertained, they were eminently entitled not only to acceptance but to favour. Nothing of party, nothing of what was termed political, except in the good sense of the phrase, could enter into the structure of the functions of their body; while men of all opinions, and shades of opinion, were united in the good work which never could arouse any feeling unfriendly to the established order of things in this free and happy country—while no disrespect would ever be shown towards the very different institutions of other countries—while the sound view was taken that those institutions might probably be suited to their diversity of circumstances—while the want of all constitutional government in some countries, and the excess of popular interference in others, might neither provoke our pity nor our envy, persuaded as we all were that our own system protects us at once from military power, and from the rule of the irresponsible multitude. The inestimable blessing of this security was due to our well balanced constitution; and the change, as it was called by some, the renovation, by others, effected of late years had certainly been attended with one consequence not to be overlooked in their present deliberations. It could not be denied that the representation of so many places by members of local influence had, with many most important advantages, one material drawback. Local interests were well represented, as they ought to be, for any system would be most imperfect which made the wants and the wishes of each place merge in those of the whole community. But it was undeniable that, with some distinguished exceptions, the general result was, the confining men's cares to their immediate constituencies in discharging their parliamentary duties. In the theory of the constitution, beyond all doubt, as in the contemplation of law, they represented the whole country, and were to consult its interests. But practically, and in fact, they were too apt to regard themselves as representing the place that returned them, and this unavoidably led to confining their views within narrow bounds, and to the neglect of measures of a catholic description. He was of opinion that any help the Association could offer in this direction would assuredly be well received by all well-intentioned representatives of the people, as it would be honestly and frankly, but respectfully offered. But hopes were cherished by many zealous friends of a progressive policy, that some improvement might be introduced into our parliamentary system which should add to the representative body a class chosen by constituents of scientific and literary acquirements, and other persons of liberal education. This plan had been strongly recommended by eminent men of all parties, including those who had presided in the Commons (Lords Eversley and Dunfermline). It might be justly observed that the existence of such a class of members would, to a certain degree, impair the force of the argument grounded upon the prevalence of local influence over the opinion and the conduct of our representatives, one of the main reasons in support of the proposed improvement being its tendency to give the Legislature the aid of counsels more free from the influence of local prejudice. But the bulk of our representatives would still be subject to that influence, and it was unquestionable that even those who were not biassed by the wishes of constituents, were under local influence, arising from another source, from their connection with the place, by residence, birth, or profession. Hence there was an additional ground for highly estimating the importance of such inquiries as should be undertaken by those who were devoted to the promotion of social improvement in its main branches, and to devising and adopting means to assist its progress. Nor let the importance be lightly considered of diffusing among the various classes of the community the knowledge of the subjects to which their inquiries would be directed, and which, though all were alike interested in them, yet were by no means sufficiently understood or estimated at their just value by the bulk of mankind. The slowness with which the humbler classes improved themselves in different branches of science; and, indeed, their reluctance to undergo the labour of studying them, had been often lamented, but without exciting the least surprise in those who duly considered the circumstances of the case. In the attempts that had been made for so many years to overcome such obstacles, and effect the more general diffusion of knowledge, the necessity had been too much overlooked of beginning with the upper classes of society. When these were well imbued with the taste for acquiring knowledge they had a natural tendency to make those in other ranks partake of the same great benefits. It was not that the whole or even the greater part of one class would become educated, but some would be inspired with the desire, not more benevolent than wise, of bearing the torch to the regions still without those lights which they themselves enjoyed. This was sound and useful instruction, propagated by a sure and rational process. Knowledge thus diffused, but especially knowledge of social interests, rights, and duties, even more than the firm and temperate distribution of justice itself, possessed the great, the cardinal value of ensuring the stability of the social system. It was, to use the language of the day, in the very greatest degree conservative, and in the highest sense of the phrase. But its diffusion had another and most happy tendency; it led to the improvement of the system, because it inspired all classes with the desire of promoting measures shown to be safe as well as effectual—in a word, wholesome reforms. Nor could anything be more groundless than the fears of progress entertained by some—affected by more. It was, in truth, ignorance continued, not knowledge advanced, which they had to fear—nay, which, when we came to an explanation with them, they really did fear. Knowledge was power; but its natural ally was the friendly power of virtue, with which its dominion was willingly shared. This was above all true of the knowledge which they would seek to impart. If any one was still alarmed at the force which the people seemed to gain when their faculties were expanded by cultivation, let them recollect that this happy process could not be continued, and further knowledge acquired, without a new security being given by that very increase of knowledge against the delusions and the excesses from which the peace of the community had most to fear. Knowledge was both power and safety, though safety was not what they alone expected; they confidently looked higher. Undaunted by the resistance of adversaries, undismayed by the obstructions which the bias of prejudice, or the conflicts of faction, or the strife of controversy, raised to impede or to retard social progress, its friends lifted up their view to the loftier heights where religious and moral truth sheds an eternal light. Piercing the darkness of ignorance that shrouds our region, the mists of doubt that obscure, the storms of passion that vex, the instinct of selfishness that chills another, the eye loved to repose on that bright summit where the same beams dispel all doubt from our opinions towards God, and warm our benevolent feelings towards men—

> "As some tall cliff that lifts its awful form,
> Swells from the vale, and midway leaves the storm;
> Though round its breast the rolling clouds are spread,
> Eternal sunshine settles on its head."

The assembly was afterwards addressed by Lord John Russell, who moved a resolution to the effect that the Association be now formed. This was seconded by the Right Hon. W. Cowper; supported by Mr. G. M. Hill, Q.C., and carried.

Thanks were voted to Lord Brougham, and briefly acknowledged; after which the meeting dispersed.

ARTESIAN WELLS IN THE DESERT.

The *Moniteur Algérien* brings an interesting report on the newly bored Artesian wells in the Sahara Desert, in the province of Constantine. The first well was bored, in the Oasis of Oued Rir, near Tamerna, by a detachment of the Foreign Legion, conducted by the engineer, M. Jus. The works were begun in May, 1856, and on the 19th of June, a quantity of water of 4,010 litres per minute, and of a temperature of 21° Réaumur, rushed forth from the bowels of the earth. The joy of the natives was unbounded; the news of the event spread towards the south with unexampled rapidity. People came from long distances, in order to see the miracle; the Marabouts, with great solemnity, consecrated the newly-created well, and gave it the name of "the well of peace." The second well, in Temakin, yielded 35 litres, of 21° temperature, per minute, and from a depth of 85 metres; this well was called "the well of bliss." A third experiment, not far from the scene of the second, in the Oasis of Tamelbat, was crowned with the result of 120 litres of water per minute. The Marabouts, after having thanked the soldiers in the presence of the population, gave them a banquet, and escorted them in solemn procession to the frontier of the oasis. In another oasis, that of Sidi-Nached, which had been completely ruined by the drought, the digging of "the well of gratitude," was accompanied by touching scenes. As soon as the rejoicing outcries of the soldiers had announced the rushing forth of the water, the natives drew near in crowds, plunged themselves into the blessed waves, and the mothers bathed their children therein. The old Emir could not master his feelings; with tears in his eyes, he fell down upon his knees, and lifted his trembling hands, in order to thank God and the French. This well yields not less than 4,300 litres per minute, from a depth of 54 metres. A fifth well has been dug at Oum Thiour, yielding 108 litres per minute. Here a part of the tribes of the neighbourhood commenced at once the establishment of a village, planting at the same time hundreds of date palms, and thus giving up their former nomadic life. The last well is that of Shegga, where soon an important agricultural centre will spring up. There is no doubt but that these wells will work in these parts a great social revolution. The tribes which, after the primeval custom of their ancestors, kept wandering from one place to another, will gather round these fertilising springs, will exchange the herdsman's staff for the plough of the farmer, and thus take the first steps towards a civilisation which, no doubt, will make rapid progress in Northern Africa.

INDURATION OF PLASTER OF PARIS CASTS.

A Neapolitan builder, Signor Abate, has submitted to the Académie des Sciences numerous specimens of plaster casts as hard as marble, and as susceptible of receiving a fine polish. Instead of saturating the plaster, as is ordinarily the mode of proceeding, with eight times its volume of water, Signor Abate combines it with the minimum quantity of water, whereby porosity is avoided, and the consequent liability to disintegration of the mass after exposure for a certain time to the atmosphere. For this purpose the plaster is reduced to a state of powder in a horizontal cylinder, to which rotary motion is communicated, and steam is admitted into the interior. By this means the quantity of water absorbed by the plaster may be regulated as desired. The plaster thus prepared still remains in a powder, and in that state is filled into moulds and submitted to hydraulic pressure for a short time. The moulded articles are removed from the moulds and found to possess great compactness and to take a fine polish.

ELECTRIC FISH.

At the meeting of the British Association in Dublin, a paper was read "On the employment of the living electric fishes as medical shock machines," by Professor G. Wilson. The author stated that, in prosecuting researches into the early history of the electric machine, he did not at first contemplate going further back than the 17th century, or commencing with any earlier instrument than Otto Guericke's sulphur globe of 1670. His attention, however, had been incidentally directed to the employment of the living torpedo as a remedial agent by the ancient Greek and Roman physicians, and he now felt satisfied that a living electric fish was alike the earliest and the most familiar electric instrument employed by mankind. In proof of the antiquity of the practice, he adduced the testimony of Galen, Dioscerodes, Scribonius, and Asclepiades, whose works proved that the shock of the torpedo had been used as a remedy in paralytic and neuralgic affections before the Christian era. A still higher antiquity had been conjecturally claimed for the electric silurus, or malapterurus of the Nile, on the supposition that its Arabic name, *raad*, signifies thunder fish, and implies a very ancient recognition of the identity in nature of the shock-giving power and the lightning force; but the best Arabic scholars have pointed out that the words for thunder (*raad*) and for the electric fish (*ra'âd*) are different, and that the latter signifies the "causer of trembling" or "convulser;" so that there are no grounds for imputing to the ancient Egyptians, or even to the Arabs, the identification of silurus-power with the electric force. In proof of the generality of the practice of employing the living zoo-electric machine at the present day, the author referred to the remedial application of the torpedo by the Abyssinians, to that of the gymnotus by the South American Indians, and to that of the recently-discovered electric fish (*malapterurus Beninensis*) by the dwellers on the Old Calabar River, which flows into the Bight of Benin. The native Calabar women are in the practice of keeping one or more of the fishes in a basin of water, and bathing their children in it daily, with a view to strengthen them by the shocks which they receive. These shocks are certainly powerful, for living specimens of the Calabar fish are at present in Edinburgh, and a single one gives a shock to the hand reaching to the elbow, or even to the shoulder. The usages referred to appear to have prevailed among the nations following them from time immemorial, so that they furnish proof of the antiquity as well as of the generality of the practice under notice. The author concluded by directing the attention of naturalists to the probability of additional kinds of electrical fish being discovered, and to the importance of ascertaining what the views of the natives familiar with them are in reference to the source of their power and to their therapeutic employment. Sir J. Richardson stated that there were not less than 11 genera of fishes known that had the power of giving electric shocks. There was one peculiarity in all these fishes, and that was the absence of scales. In every one of them an apparatus had been discovered, which consisted of a series of galvanic cells put in action by a powerful system of nerves. He read extracts from a letter from Dr. Baikie, now engaged in exploring the Niger, in which that gentleman stated that he had met with an electric fish in Fernando Po, and which Sir J. Richardson believed was identical with the malapterurus, which had been described by Dr. Wilson, from the coast of Old Calabar. The natives called this fish the tremble fish.

THE ANGORA GOAT AND THE ALPACA.

La Société Royale d'Acclimatation in France, at its very formation, has contemplated naturalizing the Yak, the Angora goat, and the Alpaca, on the mountains of that country. With the assistance of the government, the object has been accomplished as far as regard the Yak, and the Alpaca. The latter animal in particular is now to be found in all the mountains ranges, with the exception of the Pyrenees, which are now being stocked. There has, however, been some serious difficulty as regards the Alpaca. Since the wool has become an important article of commerce between America and Europe, the government of Peru has prohibited the export of these animals. The Minister of Foreign Affairs, three years ago, prepared a report to the Peruvian Government, to make an exception in favour of the Society, and permission has been given to the Consul-general for France. The Society has received authority to purchase a flock of twenty-four, and import them into France. If the Society can succeed in acclimatizing the Alpaca, the anxious desire of the Empress Josephine, which was at the point of being realized half a century ago, will be accomplished. A flock of these animals was bought for the same purpose by the Spanish Government, but in consequence of the war on the coast, they have been detained for for some time past at the port for embarcation, and only a few have arrived in Spain.

STARCH FROM HORSE CHESNUTS.

Horse chesnuts have been in considerable demand throughout the provinces of France, at prices equal to those paid last year by the starch makers for potatoes. They are required for a manufactory at Nanterre, near Paris, for the production of starch. The starch thus obtained, from a hitherto useless fruit, will take the place of that now obtained from cereals and potatoes; to that extent rendering so much more food available for consumption in the country. The horse chesnut grows readily throughout France, even in the worst soils. It is said not to be attacked by insects, like the ash, or the lime. It is suggested that as a good starch may be extracted from the fruit, parishes might derive considerable profit by cultivating this tree, one of the handsomest in Europe, along the sides of the roads, walks, and in public places.

SOUTH KENSINGTON MUSEUM.

During the week ending 10th October, 1857, the visitors have been as follows:—On Monday, Tuesday, and Saturday (free days), 3,851; on Monday and Tuesday (free evenings), 5,717. On the two students' days (admission to the public 6d.), 160. Total, 9,728. (One day closed.)

Home Correspondence.

THE DECIMAL QUESTION.

Sir,—With your kind permission, before this controversy goes any further, I would say one word, not to comment on Dr. Gray's last letter any further than as regards the phrase "injurious words," to disclaim any intention of using such. But if I have used any which, in a common case, might be so regarded, Dr. Gray, as he does, may well feel secure that his high character and well-earned distinctions would render them nugatory.

Dr. Gray, supposing him to be in error in this matter, —and the wisest are mistaken sometimes—can well afford to be wrong. His labours will remain to assist, and be gratefully acknowledged by the studious and the wise, when this feverish dust of mine, and all its thoughts, words, and deeds are swallowed up in oblivion; and I know that he will pardon me, if, as one in a nightmare, I said in my haste even a wicked word in my efforts to dispel the host of authoritative and oppressive shadows which the potent magic of his pen had conjured up around me.

I am, &c., W. MILLER.

CONSUMPTION OF SMOKE IN MARINE BOILERS.

Sir,—In your *Journal* of to-day appears an interesting report, by Messrs. Longridge, Armstrong, and Richardson, on the consumption of smoke in marine boilers. They obtained by their experiments an evaporated value of 10lbs. to 12lbs. of water for 1lb. of Newcastle coal, and they draw attention to this fact as serving "to correct an error of opinion which has resulted from the published reports on coal suited to the steam navy," by Sir Henry De la Beche and myself. We found under the boiler used, in the comparison of different coals, that 1lb. of Newcastle coal evaporated about 7½lbs. of water.

In the reports cited, we explained that we did not profess to give the *absolute* values of the coals tried, but only the *relative* values under like conditions of experiment. In fact, attention was drawn to the unfitness of the small Cornish boilers used, to give absolute results, and it was shown by us on trial to be about 20 per cent. inferior to a good Cornish boiler, and it would not surprise me to learn that it was 50 per cent. below a multitubular one.

Every separate observer, operating with varying boilers, must obtain differing absolute results. Smeaton found that 1lb. of Newcastle coal evaporated about 7¾lbs. of water, and Watt obtained the result of 8½lbs. In the recent Lancashire experiments, rather less than 7lbs. were converted into steam.

No better men than those engaged could have been selected to make the recent experiments at Newcastle; and, so far as these are described, they appeared to have been made carefully, and with judgment. The multitubular boiler employed was, no doubt, better fitted to obtain a maximum absolute result than the boiler of our relative trials. The theoretical maximum of evaporative value for Newcastle coal is about 14lbs. of water to 1lb. of fuel; and the less waste of heat there is in the boiler, the more nearly will this theoretical possibility be reached.

I am, &c.,
LYON PLAYFAIR.

London, Oct. 9, 1857.

Proceedings of Institutions.

Alton.—The report for the year ending September 30th, states that the Mechanics' Institution has now been established twenty years; and the Committee congratulate the members on its satisfactory progress. It has not yet done much in the educational movement which has of late been regarded as one of the principal functions of such Institutions, *i.e.*, in the formation of classes for adults, and for those younger persons whose school education has been insufficient; but it is still hoped that more may be accomplished. In all the objects which the Institution originally entertained, and which still have as legitimate a claim as ever upon its care and attention, there is little to be desired. There have been added to the library 81 vols. by purchase, and 11 more have been presented, during the last year; making a total of 1,196 vols., a catalogue of which is about to be printed. The books issued have been 2,731, or 52½ per week. The reading-room continues to be well supported. The following lectures were delivered during the winter, and were well attended:—An "Opening Address," by the Hon. and Rev. S. Best; On the "Arctic Regions," by the Rev. C. Boutell; Six Lectures on "Physiology," by J. W. Curtis, M.D., viz.:—1. On the "Bones, Joints, Muscles, &c.;" 2. On the "Nervous System;" 3. On "Food and Digestion;" 4. On the "Blood,—its Circulation, &c.;" 5. On "Respiration, Animal Heat, &c.;" 6. On the "Skin, the Senses, the Voice, &c.;" On "Quackery and Charlatanism," by C. M. Burnett, M.D.; On "Heroes and Heroic Ages," by Rev. G. D. Snow; "Pickings from Pickwick," by Mr. Grossmith; Two Lectures on the "Manners, Habits and Customs of the Ancient Egyptians," by Mr. A. C. Crowley; "Bothwell," a reading, by L. Leslie, M.D.; On "Heat," by Mr. F. Crowley; Selections from the "Lays of the Scottish Cavaliers," a reading, by L. Leslie, M.D.; On "Astronomy," by W. P. Snell, Esq.; On "Gwedore; its Social Condition, &c.," by the Rev. C. B. Knight; On the "Church of the Holy Sepulchre," by the Rev. C. Boutell; a Vocal Concert, by 15 Members of the Choir of Trinity Church, Windsor. The lectures on Physiology, and those on the Ancient Egyptians, were illustrated by diagrams executed by the lecturers and their friends; that on Astronomy, by the diagrams and magic lantern slides, lent by the Hants and Wilts Educational Society. The curator of the museum has just presented his second annual report, which contains fresh evidence of activity and progress in that department. During the year no less than 58 individuals have made presentations to the museum, among whom are Thomas Bell, Esq., Dr. Cullen, Miss C. J. Hooper, C. M. Major, Esq., Mr. Moody, Winchester, and the Linnæan Society. The lecture diagrams, or rather drawings, presented by Mr. Bell, constitute the most valuable donation the Institution has yet received. Several members of the natural history class have been engaged during the summer in making a collection of the plants of the neighbourhood;

this collection is not nearly complete, containing at present scarcely 300 species; but by working on through another season they will probably be able to present to the museum a tolerably perfect collection of the flowering plants and ferns of Alton. The natural history class met twenty evenings during the winter, upon which occasions there were delivered,—one lecture on the specimens lately added to the museum; three on the coal districts of South Wales, on coal fields, and on fossil floras; two on the natural history of coral islands; one on monkeys; one on fungi; and twelve on birds. There was also an examination on the lectures on birds, and an exhibition of microscopic objects. These lectures were given by Dr. Curtis, Mr. Curtis, Mr. W. T. Gunner, and Mr. P. Crowley. The Committee call the attention of the members to the favourable opportunity afforded to young men, by the natural history class, of preparing and delivering lectures on any subject in natural history or the allied sciences. It will be found that whilst the labours of the few who have hitherto sustained the class are lightened, the students who thus assist in instructing others will doubly instruct themselves by their attention being given to definite objects, and the completeness of study necessary to their success. The curator will be happy to assist them in their selection of subjects. This class possesses the best educational means at present in connection with the Institution, and it is much to be desired that the members should avail themselves of the valuable instruction offered by its meetings. A strictly elementary course of geology will form a part of the lectures delivered before the class during the coming winter; and a few lectures on reptiles will be given in continuation of those on mammals and birds. Since the issuing of the last report, a music class has been most successfully established, conducted by Mr. H. M. Powell, of Basingstoke. Meetings for instruction are held every Thursday evening and for practice every Monday evening in the class-room. Twenty-seven members of the Institution have joined the class, ten of whom have, through various causes, left. Eighteen gentlemen of the town and neighbourhood have become honorary subscribers, and by this kind assistance the class will be enabled to meet its expenses, which are necessarily heavy. The number of subscribers to the Institution amounts to 273, being an increase of 35 over last year. Of these, 28 reside in the neighbouring villages; leaving 245 resident in the parish of Alton, the population of which little exceeds 3,500. Three members of the Institution have undergone the examination of the Hants and Wilts Adult Education Society, and two of the number have had the certificate and a prize awarded to them.

Nailsworth.—The annual meeting of the members of the Literary and Mechanics' Institute was held on Tuesday, Sept. 1st, at the Nailsworth Subscription Rooms. In the absence of the president, the chair was taken by the treasurer, Mr. F. Tabram. The chairman opened the meeting by reading the report of the past year's proceedings, which shows that the present position of the society, as compared with former years, evinces no diminution in its prosperity. During the past year, the number of subscribers has been 135, being a slight increase upon the numbers reported last year. No additions have been made to the library during the present session, but the books have been in much request. The number of books at present in the library is 672. The thanks of the society are due to those gentlemen who have delivered gratuitous lectures, which have been, upon the whole, well attended. The report was unanimously adopted, and the treasurer read a statement of the society's financial position at the close of the session, from which it appeared that the receipts had been about £95, and the disbursements about £90. The officers and committee were then elected, and arrangements made for commencing the new session. After the proposal of several new members, the meeting separated.

PATENT LAW AMENDMENT ACT.

APPLICATIONS FOR PATENTS AND PROTECTION ALLOWED.

[*From Gazette, October* 9.]

Dated 12*th August*, 1857.

2152. Robert Wagstaff, Mottram-in-Longdendale, Cheshire—Certain improvements in locomotive engines to be employed on common roads or ways, applicable to agricultural and other similar purposes.

Dated 27*th August*, 1857.

2270. John Henry Christian Lobnitz and James McLintock Henderson, Renfrew, N.B.—Improvements in steam engines.

Dated 28*th August*, 1857.

2276. John Muckart, Montrose—Improvements in effecting the combustion of fuel, and the consumption or prevention of smoke, applicable to boiler furnaces.

Dated 10*th September*, 1857.

2398. George Davies, 1, Serle street, Lincoln's-inn—Improvements in the manufacture of cloth or woven fabrics composed of a mixture of wool and a vegetable filamentous material, not hitherto used for such a purpose. (A communication.)

2402. John Hathornthwaite Winder, Sheffield—Improvements in rotary steam engines and pumps.

Dated 17*th September*, 1857.

2409. Edward Hayes, Stoney Stratford, Bucks—Improvements in winding apparatus for hauling ploughs and other agricultural implements.

2411. Isaac Louis Pulvermacher, Paris—Improvements in apparatuses for creating electric currents, chiefly for medical purposes.

Dated 18*th September*, 1857.

2415. Benjamin Burleigh, 26, Great George-street, Westminster—Improvements in the mode of laying submarine telegraphs.

2419. Daniel Imhof, 547, Oxford street—Certain improvements in machinery adapted to the exhausting or forcing of air gases or vapour, and in the application of such machinery to various useful purposes.

2421. Samuel Whitehead, Bury—Improvements in "trowsers" as part of male attire.

2423. Richard Watson, Galashiels, Selkirk, N.B.—Improvements in weaving.

2425. Thomas Wilson, Bradmore-house, Chiswick—An improved boot and shoe cleaning apparatus.

2427. Sir James Caleb Anderson, Bart., Fermoy, Cork—Improvements in locomotives and other carriages.

2429. Henry Saxon Snell, 36, Chancery-lane—Improvements in apparatus for retarding omnibuses and other carriages.

2431. John Watson Burton and George Pye, Ipswich—Improvements in the construction of rollers used for pressing fabrics and fibrous and other materials.

2433. Arthur Rigg, senr., and Arthur Rigg, junr., Chester—Improvements in preparing, sawing, planing, grooving, tongueing, moulding, mortising, and tenoning wood, part of which is applicable to preparing other vegetable substances.

Dated 19*th September*, 1857.

2434. William Naylor, Bradford, Yorkshire—Improvements in power looms for weaving worsted, cotton, silk, woollen, and other fibrous substances.

2435. Montague Richard Leverson, 12, Saint Helen's place—Improvements in the preparation of food for cattle. (A communication.)

2436. François Cavalerie, 39, Rue de l'Echiquier, Paris—Improvements in motive-power engines.

2437. William Henry James, Old Kent-road—Certain improvements in steam vessels, parts of which improvements are applicable to sailing and other vessels.

2438. Richard Archibald Brooman, 166, Fleet-street—A method of decomposing soapy wash waters used in the washing and scouring of wools and cloths, of separating therefrom fatty matters held therein, and of treating such fatty matters. (A communication.)

2439. William Henry Peake, Liverpool—Improvements in the construction of beams, girders, and bridges.

2440. William Thomas Eley, Broad-street, Golden-square—Improvements in percussion caps.

2441. Henry Ormson, Stanley-bridge, King's road, Chelsea—An improvement in the manufacture of cast tubular boilers.

2442. John Minnitt, Nottingham—An improvement in extracting grease from animal refuse resulting from the manufacture of glue and from fell-mongers' processes.

Dated 21*st September*, 1857.

2443. Pierre François Joly—Improvements in apparatus for generating and superheating steam.

2444. Robert Gray, Sheffield—An improved band or cord to be employed for distending or expanding skirts or similar wearing apparel.

2445. George Schaub, Birmingham—A new or improved manufacture of rollers or cylinders, with patterns or designs thereon, for printing fabrics and other materials.

2446. Louis François Picot, Toulon—Improvements in salinometers, or instruments for indicating the saturation of water in marine boilers.

2447. Edmund Lloyd Owen, Wolverhampton—A new or improved method of propelling vessels.

2449. John Absterdan, Massachusetts, U.S.—A certain new and useful improvement in electric telegraph tables.

2450. John Paterson, Wood-street—An improvement in clasps, buckles, and other like fastenings.

Dated 22nd September, 1857.

2451. Daniel Forrester, Forest-villa, Mortimer-road, Kingsland—An improved fastening for securing watches, &c., worn on the person, whereby the same are rendered safe from robbery, to be called "Forrester's Patent Watch and Property Protector."

2452. George Jarvis Worssam, 3, Oakley-crescent, City-road—An ink self-supplying pen-holder.

2453. Meinrad Theiler, 1, North-terrace, Westminster-road — A direct printing telegraph without relais and local battery. (A communication.)

2454. Michael Henry, 77, Fleet-street—Improvements in the mode of transmitting motion, especially applicable to apparatus employed in navigation. (A communication.)

2455. John Ford, Stepney—An improved apparatus for marking or scoring at whist and other games, which may be adapted for otherwise assisting the memory of the players.

2456. Ramsey Lawson, Manchester—Certain improvements in apparatus for regulating the admission of air to furnaces.

2457. Hesketh Hughes, Wellington-street—Improvements in machinery for cutting, embossing, and stamping.

2458. George Rennie, Albion Iron Works, Holland-street—Improvements in vessels for war and revenue purposes.

2459. Alfred Vincent Newton, 66, Chancery-lane—Improvements in obtaining photographic pictures. (A communication.)

2460. William Edward Newton, 66, Chancery-lane—Improved machinery for forging metals. (A communication.)

2461. William Stettinius Clark and Benjamin Moore, 133, High Holborn—Improvements in machines for cutting splints for friction matches. (A communication.)

2462. Alfred Count de Bylandt, Michael's-grove, Brompton—Improvements in propelling ships or other navigable vessels.

Dated 23rd September, 1857.

2463. Frederick Collier Bakewell, 6, Haverstock-terrace, Hampstead—Improvements in the preparation for use of caustic alkalies. (A communication.)

2464. Pierre Oury, 8, Hatton-garden—An improved apparatus and method for impressing or marking figures or designs upon silk, cotton, or other suitable substances employed for lining caps, hats, and other similar articles.

2465. Peter Armand le Comte de Fontainemoreau, London, Paris, and Brussels—An improved method of marking paper for postal purposes. (A communication.)

2466. Adam Murray and William Pollard, Bradford, near Manchester—Improvements in the manufacture of textile fabrics.

2467. John De la Haye and Mark Bloom, Salford, near Manchester—Improvements in laying down submarine telegraphs.

Dated 24th September, 1857.

2469. William Beckett Johnson, Manchester — Improvements in raising and lowering trucks, carriages, engines, or other such railway appendages, from one level to another.

2470. Thomas Singleton, Over Darwen, Lancashire—Improvements in looms.

2471. Augustin Vrain Adrien Laugère, Orleans—Improvements in windmills.

2472. Thomas Saunders, 22, Pump-row, Old-street-road, St. Luke's—An improved tumbler key and lever tumbler lock.

2473. Abraham Booth Patterson, Baltimore, U.S.—An improved mode of laying submarine cables.

Dated 25th September, 1857.

2474. John Barber, Manchester—Improvements in machinery or apparatus for manufacturing rollers or cylinders used for printing and embossing woven fabrics, paper, leather, and other materials.

2475. John Kelshaw and John Wilkinson, Elland, Yorkshire—Improvements in self-acting couplings for railway carriages and engines.

2476. Leopold Newton, Oldham—Improvements in the mode of placing tubes on the spindles used in spinning machinery.

2477. John Fortescue, 3A, Charles-street, Middlesex Hospital—Improvements in the construction of domestic or other fireplaces for the purpose of consuming smoke and saving fuel.

2478. James Gregory, Bitton, Gloucester, and William Craymer, Bristol—Feathering and adjusting screw propellers to be used in propelling vessels.

2479. Alfred Vincent Newton, 66, Chancery-lane—Improvements in rock-drilling machinery. (A communication.)

2480. James Jackson, St. Seurin-sur-l'Isle, Gironde, France—Improvements in the manufacture of tyres for railway and other wheels.

2481. John Chubb, St. Paul's-churchyard—Improvements in the construction of iron safes and doors for strong rooms.

2482. Boydell Robinson, 25, Gilbert-street, Grosvenor-square—Improvements in the bodies and jackets of ladies' dresses.

Dated 26th September, 1857.

2484. Joseph Lewis, Salford—Certain improvements in machinery or apparatus for making bricks, tiles and other similar articles, and also in the machinery for preparing clay for the same manufacture.

2485. Richard Watson, Galashiels, Selkirk, N.B.—Improvements in weaving.

2487. George Speight, 19, Woodbridge-street, Clerkenwell — Improved head plaits, foundations for wigs, bracelets, and other plaited ornaments for personal wear.

2488. Thomas Crick and John Thorn Crick—Improvements in the manufacture of boots, shoes, and slippers.

Dated 28th September, 1857.

2489. James Broad, 149 and 150, Drury-lane—The construction of a lamp with two burners and two wicks to produce one flame or two flames, according to its regulation, by generation of gas from all and every sort of oils or spirits, naphthas, resinous and tarry substances, and also for petroleum or earth oils.

2491. George Roby, Wigan—Improvements in machinery or apparatus for raising water and employing the same as a motive power.

2495. Edouard Marcellus Blount, Paris—Improvements in distilling.

Dated 29th September, 1857.

2497. Emile Albert Lejeune, Paris—An improved crupper. (Partly a communication.)

2499. William Bayliss, Monmore-green, Wolverhampton—Certain improvements in the manufacture of chain cable.

2501. Richard Archibald Brooman, 166, Fleet-street—Improvements in raising and lowering weights and bodies in mines and other like places, in ventilating mines and other like places, and in extracting water therefrom. (A communication.)

2503. John Charles Pearce, Bowling, near Bradford, Yorkshire—Improvements in apparatus used in hot-pressing, and in the means of manufacturing parts of such apparatus.

2505. Samuel Clarke, 55, Albany-street, Regent's-park—Improvements in apparatus for burning night lights or mortars.

2507. William Edward Newton, 66, Chancery-lane—Improved apparatus for measuring gas. (A communication.)

Dated 30th September, 1857.

2509. John Henry Johnson, 47, Lincoln's-inn-fields—An improved hand-saw. (A communication.)

2511. George James Wainwright and Charles Timothy Bradbury, Dukinfield, Cheshire — Improvements in machinery or apparatus for making or manufacturing tubes or partial tubes used in spinning and doubling machinery, and for holding the same ready for use, part of which machinery is applicable to making pens, pen-holders, and similar purposes.

2513. Edwin Thompson, Phœnix Foundry, York, and William Joseph Nicholson, Queen street, York—An improvement in railway switches.

2515. Joseph Firth, Crosland Moor, near Huddersfield—An improvement in metallic pistons.

INVENTIONS WITH COMPLETE SPECIFCATIONS FILED.

2508. Rudolph Bodmer, 2, Thavies inn, Holborn—Improvements in machinery or apparatus for winding, unwinding, reeling, cleansing, measuring, sorting, weighing, twisting, and doubling silk, and other fibrous substances. (A communication.)—29th September, 1857.

2558. Jonathan Parker, State of Maine, U.S.—Certain new and useful improvements in machinery for grinding card cylinders of carding engines.—6th October, 1857.

WEEKLY LIST OF PATENTS SEALED.

October 9th.

1016. William Smith.
1020. Henry Felix Courenq.
1024. Rich. Archibald Brooman.
1031. Josiah Gimson.
1035. Joseph Maurice.
1054. The Earl of Aldborough.
1055. Robert Knowles.
1103. Chas. Benjamin Normand.
1109. William Thomson.
1137. Charles Etienne Osmont.
1155. Andre Prosper Rochette.
1157. Andre Prosper Rochette.
1163. Jas. Caddick, Thos. Hemmings, & David Caddick.
1215. Barnard Barcroft.
1305. Joseph Wm. Schlesinger.
1945. Jas. Heywood Whitehead.

October 13th.

1040. Augustus Edward Schmersahl.
1045. Charles Barlow.
1048. Robert Hazard.
1062. Robert Knowles.
1067. Bonnet Frederick Brunel.
1070. Jacob Safran.

Patents on which the Stamp Duty of £50 has been Paid.

October 6th.

35. John Henry Johnson.

October 9th.

2173. Pierre Etienne Proust.
2186. François Alexandre Nicolas Delsarte.
2319. George Taylor.

October 10th.

2191. Chas. Frederick Stansbury.
2216. George Scheutz, and Edward Scheutz.
2222. Jacob Dockray, and John Dawson.

WEEKLY LIST OF DESIGNS FOR ARTICLES OF UTILITY REGISTERED.

No. in the Register.	Date of Registration.	Title.	Proprietors' Name.	Address.
4025	Oct. 1.	Laseque's United Pipe Case	C. L. Laseque and C. E. Laseque	20, Judd-place, New-road.
4026	,, 1.	Princess Royal Safety Music Wrapper	Ann Straker and Son	35, Monkwell-street, City.

Journal of the Society of Arts.

FRIDAY, OCTOBER 23, 1857.

NOTICE TO INSTITUTIONS.

The Committee of Privy Council on Education have placed at the disposal of the Council of the Society a limited number of copies of the Minutes of that Committee for 1856-7, for distribution among the Institutions in Union.

Any Institution desiring to have a copy, should communicate with the Secretary of the Society of Arts without delay.

MANCHESTER MECHANICS' INSTITUTION.

COMPETITIVE EXAMINATIONS.

The inaugural address on the opening of the current session was delivered on Monday evening last, by the Rev. Dr. Booth, F.R.S., Chairman of the Council of the Society of Arts, on the question of Competitive Examinations. The great hall of the splendid building recently erected for the Institution was crowded in every part. Oliver Heywood, Esq., President of the Institution, occupied the chair. There were present the Bishop of Manchester; the Mayor—Sir James Watts; Sir John Potter, M.P.; J. A. Turner, Esq., M.P.; J. Cheetham, Esq., M.P.; Rev. Canon Richards; W. Fairbairn, Esq., F.R.S.; E. R. Langworthy, Esq.; E. Potter, Esq., &c.

Dr. Booth said,—I have been invited by the directors of this magnificent Institution to address you on a subject which I believe to be, perhaps, the most important social question I could place before you, an opinion in which many concur—I mean the advantages and the bearings of this great question of competitive examination; and I trust before I have done I shall be able to convince you that I have taken no overstrained view of its importance. I shall endeavour to be as simple in my language, and plain in my statements as I possibly can, and I shall do so, because I am not without hope that some of those who hear me this evening will go away with the firm resolve, the fixed determination that they, too, under God's blessing, will strive to do their duty. If I did not rest in this assurance, I should consider my coming here almost a bootless journey. It is somewhat remarkable that this question may be investigated from three or four different points of view, and that the arguments which arise under the different phases it presents recommend it to our acceptance. We may consider it as an educational, a social, an administrative, or a political question, and under each and every aspect it will grow in weight and importance the more we investigate it. Now in this system, of which we hear so much every day, there is actually nothing new. It is a mere extension to the masses of a system which has been tried in the Universities with the most signal success. All the chief honours at Oxford and Cambridge have long been decided by the test of a competitive examination. It is the chief instrument used for promoting education—in some universities it is almost the only one. You perceive, therefore, that this system of competitive examination is nothing more than a novel application of an idea long familiar to all of us, but it is not, therefore, to be undervalued. The wonders of the fire-engine (as the steam-engine was once called) were known for many years before they were applied to navigation, while the locomotive is nothing more than an extension of the same principle to tram-roads or railways. Now the great cardinal principle of this system of examination, considered as an instrument of education, is to be found in this, that it supplies new and powerful principles of action. You hold out to him who toils in solitude and works in secret, a hope, if not a certainty, that he shall be rewarded for his labours—that his attainments shall be tested, certified, and proclaimed. It is in every day use for the sons of the nobleman or the squire; why should not the son of the joiner or the weaver have a like advantage. Genius is no heirloom, and intellect does not descend like a patent of nobility. The Almighty retains in his own hands the privilege of conferring the dignity of the understanding, and he delegates his power to no mortal representative. What inducements do we hold out to him who has to fight the hard up-hill battle of life, to pore over books, or to filch from sleep the few hours he can spare for the development of those talents which have been given into his charge, those faculties with which he has been as liberally endowed as the prince or the peer. He may become a profound mathematician, as many a Lancashire weaver before him has been, but who cares or knows anything about it, or believes it be other than pretence. He may become a great chemist; who is to test his knowledge? The pure gold passes for base metal because there is no recognised authority to stamp it with the image and superscription that would make it current. There are, I doubt not, many here to-night who sympathise, aye, deeply sympathise, with those to whom I refer, and one of the healthiest signs of the moral reaction, which has set in, is that wide-spreading consciousness of our common humanity, our growing perception of the great moral and eternal truth, that whether of iron or of gold, we are all alike links of that great chain which binds the future to the present and the past. And of this sympathy what more practical proof, what more splendid memorial can we have than this magnificent edifice in which we are this evening assembled, due to the liberality of the manufacturers and merchants of Manchester! Would such a building have been a possibility thirty years ago? I have spoken so much, within the last twelve months, on this question of competitive examination as an instrument of education, that I really cannot say much about it that is new. However, as I am here, let me avail myself of the opportunity to make a few practical remarks, and to address some words, as well of caution as of encouragement to the young men who propose to attend the classes in the lecture-room of this magnificent Institution. Now let me observe that the disadvantages you labour under may be removed—they are not inherent in your condition, nor are they such as require some external power to remove. You may be hard worked; you may have to rise early and to go late to bed; you may have but few holidays and but little amusement; you may have many calls and pressing claims upon your earnings; you may have to support a bed-ridden father or an ailing mother, but you belong to no degraded caste; you are members of no subjugated race; you are excluded by no law from attaining all but the very highest social rank; you are crushed by no custom, and you are banned by no prejudice. The gates of the temple of knowledge, whether spiritual or temporal, stand wide open to receive you, if you have only the ability, the energy, and the perseverance which will carry you up the rugged steep on which it stands. Now do not mistake me. Do not for a moment imagine that I expect you to join these classes with the assured expectation that, by so doing, you are all, through diligence and industry, to rise to some high social position or other, on which you may have set your hearts. You must guard against this castle-building. Such vain imaginings are no better than a day-dream, and you are sure to be disappointed. Leave the future in the hands of Him who will decide for you better than you can for yourselves. Enter the classes with the hope that your diligence and industry, your energy and perseverance, shall at length place you in the proud position of that servant to whom the ten talents were entrusted. And even though you should not succeed in life to the full extent of your anticipations, though you may be distanced in the race, you will have no cause to lament your exertions; you will not have to look back with unavailing regret on the opportunities you had neglected, or the leisure you had wasted; you will have done your part, and it will not be your fault that you could not command success. You who intend to proceed beyond the mere elements of a common English education, will do well to turn your attention to the study of those subjects for which you have a natural aptitude, and which are the most likely to be of value to you in the common business of life. You will cultivate the former, because they are the intellectual food suited to the diversities of your understandings, and you will cultivate the latter, because for you, knowledge is not a luxury, but a necessity. And by the way, if I had time, I might illustrate to you how curious the adaptation, how wise the prevision, that for every phase of the understanding there is the appropriate subject of contemplation; music for the sense of harmony, mathematics for the analytical, and external things for the observant faculties. Now, if any of you are in the office of an engineer or builder, practical mathematics will be of use to you; if in manufacturing or dye works, chemistry will come in to help you, when, perhaps, you least expect it. If you should be engaged in houses with a large foreign correspondence, modern languages will enhance the value of your services. I have often heard it said by persons who might have learnt but did not, "Well, I should like to get up such and such a subject, but I have no one to teach me. I learn better by the ear than by the eye." By some it is taken up as an unquestionable truth, that there can be little or no learning but through the medium of oral instruction. I have no faith in this opinion. I believe that the amount of knowledge which anyone of us possesses, is directly in proportion to the strength of the intellectual power and toughness of will he puts forth. External aids may cause it to sprout up more vigorously than when left to its own development, but it will be weakly. The oak nurtured in the green-house, has not the strength and elasticity of the hardy sapling on the bleak hill-side. Now these are only simple principles, but see what a world of facts and phenomena of every-day life they will explain. Hence the precocious child, and infant prodigy, who turns out a silly lad and an imbecile old man. Hence, too, the youth furnished with the most dexterous and assiduous tutors in every department of knowledge, supplied with every text-book and commentary, provided with a most comfortable and cosey study, richly carpeted and furnished with all the appliances of study and means to boot, often turns out, when he enters on the business and duties of life, but a very common-place person after all. To cut a bar of iron in two with a single sweep of a broad sword, requires a well-tempered weapon, a vigorous arm, and skill to wield the blade. In the same way you need the keen and tempered intellect, the strong determined will, and the facility which education alone can give to enable you to overcome those obstacles both from within and from without which hinder your progress, and impede your efforts. Learning is like food, of which it is injurious to health to take more than the stomach can digest and assimilate. One man, with a quick, sharp intellect, soon masters the outlines of a subject, while his slower neighbour has spent his time in plodding over the elements. But the mental force used up, and the corresponding work, may be, though not equal, yet equivalent in value. It is the old story of the hare and the tortoise. To you who know something of mechanics it will be a familiar illustration, that one man by the help of a single pulley lifts a light weight rapidly, while another with a system of pulleys lifts a great weight very slowly. The muscular exertion is the same in both cases, but the system of pulleys is generally the more valuable and useful instrument, though not always the most handy. Read the lives of Crompton, of Cartwright, and Watt, of Gifford, and Sir Humphrey Davy, of Brindley and Stephenson, and when you have gone over them all—you have them in your library—just ask yourselves what was that one quality of mind in which these men all most resembled one another. You will find it was indomitable resolution, and inflexible tenacity of purpose. They were not what you call brilliant men, nor eloquent men, nor witty men. Had you met one of them and known nothing about him, you would, I little doubt, have thought him a very silent, if not stupid person. But they never looked to the right nor to the left, the one object was kept unceasingly in view. And they had that transparent clearness of conception which intensified concentration of thought alone can give. Contrast with any of them that rarely-gifted talker Coleridge, and you shall see to what transcendent genius and subtle intellect may lead when yoked with tottering resolution and a wavering will. You have here a liberal supply of those aids to the advancement of the human intellect, the most powerful which the wit of man ever devised. I mean printed books. You cannot overvalue a full and a cheap supply of them. Believe me, as I have said on a former occasion, they are your best teachers. They will not get impatient at your slowness, or angry with you because of your stupidity. Your books will not get weary with giving you information. They will repeat it for you again and again. If you have misunderstood anything they have said, or are slow to comprehend them, they will wait patiently until you are prepared to proceed. They will put up with your ill-humour, they will bear with your mistakes, and they will cost you but little to keep them. It is my settled opinion that there is not one person here this evening whom God has gifted with the common average share of ability,—neither genius nor talent are at all requisite,—and who has strength of will to carry him through the drudgery and over the obstacles which he is sure to meet with at the outset, that cannot master the elements of any science or language, for the comprehension of which he has been furnished with the necessary ability. Now, some one here may be disposed to ask, how it is that comparatively so few do carry out any such course of study? How frequently is it that, when a class is opened in this and indeed in most other Institutions as well, a large number joins at first; soon after, the attention begins to diminish, until only two or three are left, perhaps none at all. The answer is obvious, and confirms the views I have long held. They lacked that force of will and depth of purpose to intensify their resolves, and which would have strengthened them in their pursuit of knowledge, in the face of those difficulties by which they are and must be opposed. Now, examination is the one thing necessary to counteract this torpid, desponding, state of mind. It breathes hope, defines purpose, limits the objects of pursuit, makes a man take note of the value of time,—only so many months, so many weeks, so many days until my trial comes on. In a letter which I wrote some short time ago to the Directors of the Polytechnic Institution, Southampton, I said:—

"The friends of education may rest assured they will effect but little towards the advancement of the great cause they have in hand, unless they continue in some way to enlist the sympathies of, and awaken an interest in, those whom they propose to instruct. Now there is no more effectual method of doing this than by testing each man's work and stamping it accordingly. An examination in prospect concentrates the candidate's attention on some one or two special subjects of study; it supplies an effectual check to the great intellectual vice of the present day, loose, rambling, and desultory reading. As it daily draws nearer, it daily affords a more powerful motive to exertion, and thus invaluable habits of persevering application are imperceptibly wrought into the very grain of the character. The algebra or the trigonometry of the candidate may be worth very little, while the habits formed in the process of their acquisition may be of the utmost value. Other motives to study may be of a higher and nobler character; they afford, however, but a feeble support to prolonged exertion in the face of discouragement and difficulty." And again, I said, "it would give a very faint and inadequate idea of the good which these examinations of the Society of Arts are now silently but surely effecting, if we were to estimate it only by the number of candidates that actually do come up for examination. A new spirit is excited in the Mechanics' Institutions, new classes are formed; systematic instruction is now, for the first time in many of them, given; and when a candidate leaves his Institution to come up for examination, all his neighbours and townsfolk feel a deep interest in his success." And of this I gave an illustration from a Yorkshire paper. Again, that well-written organ, and influential exponent of middle-class opinion, the *Daily News*, speaking of admission into the Artillery and Engineers in an admirable leader, the other day, thus proceeds:—"It may be said that this system, corrupt as it was, bad in principle, and demoralising in its effects, after all procured a very decent set of officers for the scientific branch of the army. They were, to a certain extent, educated for their profession, and so contrasted most favourably with the other officers of the army, the bulk of whom obtained their position by money and influence alone, without any professional education. But the nation has a right to demand something more than this; we have a right to obtain the best talent of the country, for our engineers and artillery. And we would maintain, without fear of contradiction, that had this system of political patronage been abolished years ago, the nation would have been immensely the gainer. The foundation of the scientific education for the artilleryman or engineer, depends on the cultivation of the mathematical sciences. In France, accordingly, we find that the highest mathematical schools in that country are the military schools. The most distinguished cultivators of the mathematical sciences are the Professors in those schools. In this country, the military schools are the lowest class in the cultivation of mathematics as compared with the French, and the only schools which can at all compete with our neighbours are the Universities of Cambridge and Dublin, places for the education of our statesmen, lawyers, and divines, not of our soldiers. The abstract sciences connected with and under the name of mathematics, require a considerable stimulus for their successful cultivation. Hard work and continuous thought, are not undergone by men in general without some prospect of reward. The branches of the public service which most require the cultivation of the abstract sciences, have been shut out from competition. They have afforded no prize for the diligent student. French professors who have visited Cambridge, have been astonished at the answering of the candidates for honours in the mathematical tripos of that university. They have wondered what became of the incipient Newtons and La Places, and were still more astounded when they heard that the law and the church absorbed all this talent, which, but for our political folly and perversity, might have been devoted in great measure to the service of the country, in a position where its worth could, at any rate, have been tenfold more apparent. Now, how has Cambridge attained its eminence as a mathematical school? Simply by the exercise of an almost unlimited system of competition for the prizes at her disposal. Her fellowships, tutorships, and other prizes, for the most part are open to, and attainable only by those who distinguish themselves by obtaining the highest places in her mathematical examinations. Her examiners are beyond reproach or suspicion. The justice of their awards is never questioned. Every one therefore feels that the prize may be obtained if he works for it, and has the requisite degree of talent. No political or other patronage is required. The prizes are open to all, with the exception of those who are precluded by their religious opinions from obtaining them. Competitive examination, therefore, fairly and honestly carried out, has done—what? Why, produced one of the best, if not *the* best mathematical school in Europe."

But there is nothing new in all this. It would, indeed, be very strange were it otherwise. The Almighty has laid down the irreversible decree that labour shall be the condition of acquirement, whether it be knowledge, or habit, or mental accomplishment, or manual dexterity, or wealth, or position. Expenditure of muscular force or intellectual energy, is the price. True, men sometimes labour and do not acquire, while others enjoy the rewards of industry without toil, as if a man should stumble on a treasure by accident. But there is this great difference between personal and external acquirements, that in the former case it is our own personal labour that must be the ordained equivalent, while in the latter case, the labours of others will suffice. Thus, a man is a peer because his father happened to be one before him, but no one can lay claim to genius or learning by inheritance. A lord chancellor transmits his peerage to his son, but not his eloquence or his legal knowledge. These illustrations may seem trite, but they confirm the great moral truth, that labour, bodily or mental, is the price we must pay for any acquisition we desire to make. Now to apply these principles. It will follow from what I have laid down, that men cannot acquire or, at all events, assimilate knowledge, so as actually to work it into the very warp and texture of the understanding, by merely listening to lectures. But I wish to guard myself against misconceptions. It does not follow, if a lecture, or indeed anything else, be not good for a particular purpose, that it must therefore be of no use for any other. Now, a lecture may be of great value; it may draw attention to a subject of great importance, just as I am now engaged in the attempt to interest you in the educational bearings and social aspects of the question before us this evening. Lectures afford amusement, and very proper it is that they should. A man cannot always be engaged in bodily labour; he must have his day of rest; so neither can he always be racking his brain. There must be a Sabbath of the understanding. Thus lectures amuse—they excite attention, and they often brace up the will and nerve the mind to action; but you cannot learn from them directly, without a vast expenditure of thought and labour, and, in some cases, not even then. Only think of a man learning to play on a musical instrument by dint of attending lectures on music; or to swim, by lectures on the art of swimming; or to make shoes or boots by attending courses on the construction of these very useful articles. Indeed, if it were otherwise, we should have a flat contradiction to the principle I laid down a while ago, that we must pay in labour for our acquirements. Here you are under no comparative disadvantage; the son of the prince or the peer must do the same; if he has ample leisure, you have urgent necessity; if you have the demands of daily labour to meet, he has the multiplied seductions of fashion to resist; so that the race is not so unequal as at first sight it would appear. But, in speaking of lectures, or even of examinations, they constitute but a very small and fractional part of the educational agencies at present in full operation throughout this country. There are your churches and your chapels, your Sunday-schools and evening schools, your newspapers and your broad-sheets, your public libraries and your railway literature, your lectures and your classes. Then you have unwonted facilities for travelling; from the earliest times travelling has been one of the chief elements of education; and you have your cheap letter-postage and your book-post. In short, everything which directly or indirectly leads a man out of self and selfishness, that is, educes him out of them, or draws him out, is an element of education. Any mode by which you can exercise the intellect, is an instrument of education. At the meeting, the other day, of the National Association for Social Science, held at Birmingham, Lord Hatherton mentioned to me a plan he tried with great success at his National Schools at Penkridge. He requires the elder boys to write monthly letters to himself, detailing what they saw worthy of note during the past month; such matters as come under the notice of country lads—strange birds, curious insects, changes in the weather, ripening of corn, or the like. Now, the anticipation of having this letter to write, keeps their powers of observation on the stretch to find materials for it, and the putting these materials together is an admirable exercise in that most simple, yet most rare accomplishment, the art of writing a good letter. Lord Hatherton told me that the improvement of some of the boys, and the quickness of observation of others, were very extraordinary. Now, this too is education, and education of the best kind for children such as these, who require for the business of life a sharp and ready intellect. See, too, what a magnificent though transient memorial to the educational tendency of the age have you completed not far from hence, two days ago. Many a year will pass away before the Art Treasures of Manchester shall be forgotten. Who could gaze up the long-drawn aisles of that phantom palace, and view without emotion those gems of art and priceless treasures saved from the wreck of time, and here for once collected. Every picture is a human history, a sort of moral photograph, which gives of each succeeding age the "form and pressure." When the astonished traveller stands at the base of the Great Pyramid of Gizeh, and, wrapt in awe or lost in admiration, gazes upward along the face of that huge mountain of stones, sloping far away into the sky, and "looking tranquillity;" his thoughts go back to the time when, thirty centuries before, the face of that vast mound swarmed with human beings, the hopeless slaves of arbitrary power, ground down by unrequited toil; and the saddening reflection rises in his mind how much of man's vain labour, and human suffering, and unredressed wrong is fossilized in those old and sand-swept stones; so, but with feelings widely different, may the visitor to your building on Saturday have contemplated how the inspiration of genius, and fervid imagination and profound thought, glow on the canvas, and shine forth to tell of that vast array of intellect of which those works of art are the visible and eloquent memorials. Truly these latter times are better than the first. There is no book written, no history ever penned, so full of records, as that Art-Treasures Building, of men who, surrounded with early difficulties, cramped by poverty, and chilled by neglect, had yet persevered with that strong tenacity of purpose, that unyielding force of will which carried them over every obstacle. They never gave over till they had attained their object. You have had the creations of those men before your eyes, almost in your hands. Who can contemplate the works of that brave old man, Bernard Palissy the potter, that dauntless Huguenot, who for his faith went to prison, and was ready to go to the stake, without being struck with the prodigious power of unshrinking resolution he displayed, when, in despite of failure after failure, the ridicule of enemies or the sneers of friends, he still held on till his efforts were crowned with success. You have had the works of him before you, who, on seeing for the first time a painting of Raphael's, exclaimed, "And I, too, am a painter!" Read the lives of the two Caravaggios, and you will see how much dauntless perseverance can effect. I might in this way go through a large number of the names in the catalogue.

Having discussed the bearings of this question as it regards the candidates themselves, let us now consider it in some of its social aspects. If young men, who are in a great measure their own masters when not engaged in their employer's service, had a steady definite object set before them, one that was desirable, and that might be attained by a manageable amount of hard work, consider what an indirect but powerful motive to action you would supply. Now if a young man engaged all the day in his employer's service, works during his spare hours at his subjects of examination with all that preoccupation of mind which hard work alone can give, it is quite clear that he cannot saunter about or frequent places of amusement. The two things are quite incompatible. It is the young man who has got nothing to do, who does not care for reading, whose idle evenings hang heavy on his hands, he it is who is the fast young man, not the hard-working student in a class at a Mechanics' Institution. It is an old proverb, not more trite than true, that idleness is the root of all evil, and experience confirms this. I have been recently told by one of her Majesty's inspectors of schools, that the young men selected by competition for appointments as clerks in the Privy Council Office have hitherto given great satisfaction. They are so quick and intelligent, that they give but little trouble. They require but a small amount of drilling. This is very gratifying; because, there are plenty of persons on the watch, who would be delighted to discover any flaw in their conduct. There is another point of view, in which competitive examinations, to be followed by nominations to employment, would be of the utmost possible value. There are upwards of 600 clerkships in the Customs, Post Office, and Excise, vacant every year. If they were avowedly distributed as prizes, see how it would affect the stay of children at school, about which so much now is said. Ten years ago, I wrote as follows:—"One great advantage that might be expected to arise from the adoption of such a plan,"—speaking of giving junior public employments by competitive examination—"is this, that instead of exciting the opposition of, it would enlist the schoolmaster in its favour, and stimulate his exertions. It would foster a spirit of laudable emulation between the schools of the same educational circuit. The proportion of candidates coming from any given school, which should usually pass a successful examination before the examiners, would soon, in the estimation of the public, become the test of the quality of the education given there, so that instructors of youth would be appreciated by their merits and the success of their pupils, and not, as is but too often the case, on other grounds far removed from educational qualifications. Such a plan as is here proposed would do more to raise at once and immediately the character of the education of the middle classes, than almost any other practicable one that could be devised. It is one that would call for no previous outlay or tedious preliminary organisation. Taking the materials and machinery provided to our hands, it would set to work with them. It would not impose the necessity of building new schools, or of founding colleges, or endowing professorships, but being applicable to the institutions and schools already in being, would leave education in the hands of those who at present conduct it. It would interfere with no vested rights whatever, real or supposed; co-operating with all, antagonistic to none, it would neither provoke hostility, nor excite jealousy. It is quite true that education is looked upon by the public as a means to attain something else, rather than as an end complete in itself. Now this very state of public opinion might be brought to bear with its whole force on the improvement of education, by directing into a proper channel those motives of self interest which so absolutely rule the great majority of mankind. For when men discover that the prospective interests and the future advancement of their children are palpably dependent on, not obscurely connected with, the quality and the amount of education they receive, inferior schools, imperfect instruction, and incompetent teachers will not long be tolerated." Well, this was written ten years ago, but it is the staple of all that was said to the purpose at the Conference at Willis's Rooms some months since. The thing comes, after all, to this—create a constant and ample demand of well-instructed persons for employment, and you shall very shortly have an abundant supply. The law of supply and demand holds just as well in education as in commercial matters. Produce or create the demand, and the supply is sure to follow. Again, I have said, "See how such a system as this would affect schools over which no authority can at present exercise any direct influence. A Board of Examiners would lay down the subjects for examination; they would define the minimum extent to which the study of these subjects should be carried; accounts of the proceedings which took place at the examinations would appear in the newspapers; lists of questions would be published, which would in general indicate the amount of knowledge expected on the several subjects, the manner in which they should be prepared and known, the relative value and importance of the several departments of the examinations. A powerful influence would be brought to bear on schools, classes, and private teachers. Some would become known to the public through the successes of their pupils; they would be sought out accordingly. Those schools would be filled, and their classes multiplied, while the inefficient teacher would be deserted. In this way a reform in existing schools would be originated, not due to pressure from without, to be neutralised by evasion and quibble, but spontaneous, and therefore earnest—universal, as proceeding from causes everywhere in operation—and effectual, as founded on self-interest. A reform would in this way be silently, surely, and thoroughly effected, which no Act of Parliament could produce, or decree of the Court of Chancery enforce. It is so obvious as scarcely to require a passing notice, that the example of a few successful candidates influences a crowd of others to follow in their steps. I believe—indeed, I have reason to know—that the classes attending the several Institutions throughout the country were never so flourishing as they are likely to be this winter. So true it is that a little leaven leaveneth the whole. Even the very limited scale on which the Society of Arts has hitherto conducted its experiments of examination has produced incalculable good. The success of the candidates we sent up to compete for clerkships in the Privy Council Office proves the attainments of the men, and the sterling reality of the examinations. Last year, we were permitted to send up two candidates—they obtained first and fourth places, respectively, out of five. This year, four of our men obtained first, second, fourth, and sixth places out of six vacancies in the Privy Council Office, on nominations placed at the disposal of the Council of the Society of Arts, by that consistent and enlightened friend of education, Lord Granville, who gives up the large patronage of his high office to promote the success of this great measure. Lord Palmerston, too, has placed two nominations at the disposal of the Council of the Society, as you may have seen in the public papers. But while the Government deserve praise, not so much for the little they have done, as for stamping the principle with official approbation, let me add that the encouragement which the state, however well disposed, can afford, to promote in this way the education of the country, is absolutely insignificant as compared with that which the employers of labour can give by their recognition of certified intelligence and industry. Were the manufacturers, merchants, public companies, and others, to lay down the rule, that other things being equal, they would give the preference for employment to those applicants who could produce unquestionable proof of industry and application, I believe the education difficulty would be solved. I do not say they should be the Society of Arts certificates—other bodies, no doubt, will come into the field, equally deserving of confidence. But this I say, that the Society of Arts is doing its best to deserve your confidence. We have no wish to keep our Society a mere metropolitan society, we desire it to become a national association. What is the universal complaint of the clergy and the other friends of education throughout the country? what was the cause assigned at the meeting of the National Association at Birmingham, the other day, for the early removal of children from school? The demands—the increasing demands of the labour market for the manual services of the young; while the idle and the dissolute, the headless and the handless live in all the abject misery of contented sloth, at the cost of the community. There is no natural love of learning in the people—they do not value it; they do not respect him among themselves who is supposed to be skilled in learning, nor do they think anything the worse of the man who is without it. As in so many other cases, you must create a public opinion by whatever means you may, so that ignorance may be discouraged and discountenanced. To constitute an efficient public opinion all classes must combine, and I know of no agency better fitted to bring about that most desirable result than that of the National Association for the Promotion of Social Science, inaugurated last week at Birmingham. Again, it will be said, your examinations reach but a small fraction of the people. This, unfortunately, is only too true. However, it may be said in our defence that it is something, in this age of washy talk and pretentious shams, to set an example of actual work, which the universities did not think it beneath them to copy. This is something, and we shall proceed, with the co-operation of the Institutions, to develop the plan. This system of promoting education by the help of examination is widely extending its influence. The English and Irish Universities have taken it up; the Royal Dublin Society has taken it in hand for Ireland; Mr. Acland has introduced it into the western counties with much zeal and considerable success; while Mr. S. Tremenheere, to whom the education of the poor is so much indebted, has established a similar scheme for the children of the poor in the County of Stafford. Miss Coutts has displayed much zeal in the same direction, by her prizes for a knowledge of "common things." The Hon. and Rev. Grantham Yorke has established a prize and certificate scheme for Birmingham, while the Hon. and Rev. S. Best has done the same for the counties of Hants and Wilts. Even in Australia the example of the Society of Arts is held up for imitation. I shall now conclude my observations with a few remarks on the political aspect of the question. I believe there can be no doubt whatever that there is a growing disinclination, on the part of the House of Commons, to deal with this question in a comprehensive form, or, indeed, in any form at all. Look at the summary rejection of Lord John Russell's propositions last year;—hear the tone of individual members of Parliament, addressing their constituencies or public meetings. This day fortnight I was present at Basingstoke, at a meeting of the Hants and Wilts Educational Society, when Mr. Sclater, M.P. for North Hants, in the course of his speech, said that—"He did sincerely rejoice that the subject of education, by common consent, appeared to be taken away from the House of Commons. Various attempts had been made to bring forward a great comprehensive scheme for the education of the people of this country. He thought it very fortunate that those attempts had been uniformly unsuccessful. He was highly gratified to see the efforts which were being made. They were producing far more satisfactory results than a House of Commons Act of Parliament." I might bring before you the observations of many others as well. Mark the altered tone of the *Times* newspaper, that great barometer of public opinion. Sir J. Pakington, that most indefatigable and zealous promoter of the education of the poor, and upholder of their rights, at the meeting of the National Association in Birmingham, the other day, observed, "however unwilling they might be to admit it, the fact could not be denied that Parliament was partly unable and partly reluctant to deal boldly with these subjects. It was said on the previous evening, and with some truth, that Parliament was so overwhelmed with work that they had no time to deal with other matters than those placed before them in a distinct and practical shape; but he thought it was a matter for anxious reflection when they found that Parliament, whether from want of time or want of inclination, had as yet been unable to deal satisfactorily with the momentous question of education." Therefore, to meet this state of things, you must have local organization, and this, if for no other reason, that no ready cut-and-dried system will suit all places alike. The instruction of the children in a seaport town must differ from that in an agricultural district, and this latter would not be adapted for a manufacturing locality. I really believe that if ever there is to be an organised and truly national system, it must be based on local management and provincial responsibility, with government inspection and periodical examination. These are, in my opinion, the three fundamental principles of a national system: local organisation, government inspection, and central examination. I cannot stop here to show what a world of difficulties would vanish under a judicious combination of these three principles. Now, I have no desire here to enter on an inquiry how far this altered tone of public feeling is due to the shortcomings of the official departments during the last war, whether some fear has not been felt that mismanagement might just as easily creep into the department of public instruction, as well as into that of the Admiralty or War, and I think one consideration will prove to you that you have not sustained much loss by the State not taking the management and control of the education of the people into its own hands. Just consider what, most probably, would the education of the higher classes in this country now be, were the two great Universities of Oxford and Cambridge mere Government boards, constituted at the will of the minister of the day, instead of being, as they are, independent self-governed bodies, completely free from the interference of the State, and responsible to the laws of the country, and to national opinion alone. Do you imagine that it would have promoted the cause of true religion, or the cultivation of humanising literature, or the investigations of abstract science, for all of which those splendid seats of learning are renowned, were the Secretary of the Treasury to fill up all the fellowships in the several colleges, or the Chancellor of the Exchequer to administer the revenues, or the Home Secretary to nominate all the tutors. Could the wit of man imagine any exercise of patronage more deplorable than this. How, then, are all those fellows and tutors, of whom I speak, elected? Why, by competitive examination. And what system above all others would you deprecate? Certainly that of nomination. Why not, then, borrow a lesson from the past and multiply independent societies of this kind, to do for the middle and lower classes, that and that only which the Universities do for the higher. I will venture to say that throughout the length and breadth of the land there is not a single Institution more deeply cherished in the very inmost heart of the nation, than these time-honoured, ancient abodes of learning, keeping themselves bravely in the front of an advancing civilisation. Is there one man in this entire land who would desire to see them converted into Government boards. And here one might pause to ask how it is that men no longer tremble at the name of the Government. Shall I say that we do not even respect it? Do we wait in trepidation to hear what measures may be in preparation? Nothing of the sort. We well know that there is nothing coming, or likely to come, but what has been well discussed in newspapers, pamphlets, and reviews, long before. The feeling of the people towards the Government a century ago was very different. It was looked up to with awe as a mystery, which no unclean hand might touch, or profane tongue censure. Men feared it while they disliked it. Now, what is the cause of this change? I apprehend it is this. modern cabinets have abandoned the initiative functions of Government, and resolved themselves into Administrations. That is to say, the cabinet of the day, it makes no matter, whether Whig or Tory, Radical or Conservative, administers the affairs of the country, while the country governs itself. Hence Government officials, being fully occupied with the executive duties of their own offices, have neither the time nor the inclination to discuss measures for improving them. Hence, too, no Government in these days brings in, or attempts to carry, a measure on its own responsibility. It must be urged from without; popular opinion must be brought to bear on a question, before the Government will even entertain it. Moreover too, divided as the country is now on this question of education, you may easily perceive the utter hopelessness of the Government doing any more than it does at present. In my letter to the people of Southampton, I said, "Now that this question of education has been discussed for so many years in all its political, religious, and social aspects, without any mutual approximation of the contending parties, and as a national solution, in which the majority shall agree, seems now to be as far off as ever, would it not be as well to give over discussion, and with the machinery and the means provided to your hands, try to effect something practical. But there is another reason why the Government is every day more and more disposed to remit social questions to independent management and to local organisation. As, for example, a session or two ago, when Sir Benjamin Hall, instead of making a new Government department, to take charge of the sanitary condition of London, established a sort of little parliament, called the Board of Works. The fact is, this empire is becoming so vast, the interests at stake so important, the varieties of the human race we have to deal with so numerous, that, in the words of the ancient historian, we can neither bear our burdens nor cast them off. Our present form of executive government, which differs very little from that in the time of Queen Anne, was constructed for the government of England alone. Now it not only deals with Scotland and Ireland, but with the whole British Empire as well. Why, our exports during the last seven years are nearly doubled; from 75 millions they have risen to upwards of 130 millions. We have vindicated in the late Russian war our rights so effectually that they are not likely soon to be questioned. We have colonies, the centres of future civilisation scattered over the surface of the habitable globe, and, last of all, there is India. Now, I am not going into any detail of those horrible atrocities with which you are all unhappily but too familiar. Why, the intelligence from India alone has decided the question of competitive examination. When that country shall be settled, as soon it will, only reflect what a vast field will be thrown open to British enterprise in India. Thousands upon thousands of young men with ready hands and resolute hearts will uphold the name of England amongst that treacherous and cruel people. Consider the vast number of appointments that will now for the first time be held by Englishmen. To you who are rising into manhood, glorious opportunities of good will spring up on every side. Many a young man now attending a class at a Mechanics' Institution will find his sphere of action on some great railway or other public work in India, and let it be the reflection ever uppermost in the mind of such an one, that the natives are always ready to compare, and if possible to contrast the purity of Christian profession with the actual practice of daily life. Some persons seem to think that, as soon as the present excited state of opinion in this country shall have subsided, when the Crimean calamities shall have been forgotten, and men's thoughts revert to more peaceful subjects of contemplation, these competitive examinations will be allowed to drop, and matters will gradually return to the state they were in before; that nomination will again take the place of competition, and that we shall have the same cycle of mistakes, faults, and blunders all to go over again. Now I do not believe this prediction, because I look upon this change as a necessity of our time. You might just as well expect to go back from railways to stage-coaches, or from the electric telegraph to the Post Office, or from this latter to the mounted and belted postman of the olden time. The fact is, we English are actually too few in number for the gigantic work we have undertaken. Here at home are our own vast commerce and manufactures to be managed and controlled. What amount of intellect is expended on the trade of Manchester alone? Then we have Australia to colonise and reclaim, the fertile regions of New Zealand to civilise. The Chinese difficulty is looming on us through the lurid mist which rests on the soil of India soaked and reeking with English blood. The truth is, we must cultivate intellect as we cultivate corn, and for the same reason, that the spontaneous production of nature does not afford an adequate supply. When our ancestors, or whoever they were who first occupied this country, took possession of it, hunting and fishing, with the scanty produce of the soil, afforded a subsistence. They were soon forced to supplement nature by labour. So in like manner, one or two centuries ago, the natural talent which shot up here and there in proud luxuriance above the dwarfed and stunted products of the intellectual soil, supplied all our wants. We had no lack of all the energy and talent that we needed; what came to hand sufficed. But now all this is changed. Those persons whom God for His own wise purposes has freely endowed with those unpurchaseable gifts, must be sought out and cherished, not for their own sakes, but for the common use and benefit of mankind. And this naturally leads me to notice one or two objections which you must have often heard before. It has been said, while you propose to promote intellectual development by the help of these examinations, you do not profess to apply them to the improvement of the moral and religious character. We do not propose to do so, and for this reason, that while examination is a test of the utmost value in ascertaining the reality of intellectual attainments, it is utterly worthless as a means of ascertaining the state of our religious feelings. A man's actual knowledge, whether of mathematics or physics, or chemistry, or geography, or any other science, is in no degree dependent on the motive which induced him to cultivate any of these subjects, whether it be love of money or love of fame, or love of the study for its own sake, or from the still higher motive—a sense of duty. The reality of the knowledge is entirely independent of the quality of the motive. But now, on the other hand, only think of a man performing an act of piety, or self-control, or benevolence, or self-denial, because it will tell in his favour at the next moral-examination day. Such a motive would completely transmute the nature of the action. Instead of being an act of conscientious duty, it would become one of calculating selfishness. Therefore we cannot be too cautious in confining examination rigidly to the proof of those things only of which it is the test, and ignoring it where its evidence is fallacious and illusory—namely, the discovery of the true state of the moral feelings. Another popular objection is this, and indeed I never heard any opponent to competitive examination who did not use it as his most popular and telling argument. It comes, when stated plainly, to this: It is a spurious and unworthy motive to put before men to urge them to exertion, the hope of bettering themselves. It is appealing to a man's selfish feelings. The dignity of learning, the charms of literature, or the pleasures of scientific investigation, are their own best rewards. The pleasure a man receives from reading, ought amply to compensate him and urge him on. Now it is absurd to speak of persons working hard at the very elements of learning deriving pleasure from study,—the pleasure may come afterwards, but at first it is sheer drudgery. But, putting aside the facts that our higher classes are stimulated to exertion by the hope of prizes, scholarships, fellowships, professorships, peerages, and the like, putting aside the fact that we do not say to the lawyer who has just triumphantly gained our cause, that the pleasure he must enjoy from the public manifestation of profound legal knowledge, and the open display of his transcendent eloquence, ought to be ample reward for him, without dimming the brightness of his enjoyment by the glare of that dirty dross called gold, in the form of a fee or refresher; putting aside, I say all these, if we assert that the pleasure we derive from study is our fitting reward and justification for pursuing it, what shall we say of those who derive pleasure from the reading of loose, immoral, or licentious books—are not they justified, too? if pleasure be the measure of propriety, do not they satisfy the test? See what your principle leads to; but I take an older and a higher ground than this. I say, it is a man's duty, if God has endowed him with any choice talent or rare gift, to cultivate that gift to the utmost, for, we may be sure that it has not been given him in vain; and not only to cultivate it, but to use it, and to make it known. If God has endowed a man with a talent for mathematics, it is his duty to cultivate mathematics. If he has been entrusted with no such gift, he is not called on to engage in this study. All this, you know, is infinitely better said elsewhere, in a Book I hope familiar to all of you:—"To whom much is given, of him shall much be required." We may be quite certain of this, that every act of ours performed now, will tell upon the future. No human eye may trace, much less historic pen record, their silent, imperceptible influence, in ages yet to come. Small though it be, yet it will be there. How often do the mightiest results seem to follow from the most minute and apparently trivial actions. Illustrations lie close at hand, but I have no time to use them now. The effects of human actions will vibrate through successive generations of mankind, just as the pebble dropped into the sea sends a vibration to the furthest recesses of the ocean. Minute and feeble is the electric shock, yet it flashes thousands of miles along the telegraph wire. Let us, then, follow the advice of the Preacher:—"Whatsoever thy hand findeth to do, do it with thy might, for there is no work, nor device, nor knowledge, nor wisdom in the grave." We shall then rest from our labours, and our works shall follow us.

DESIGNS FOR LAYING OUT THE SURFACES AND SUBSOIL OF NEW STREETS.

The Metropolitan Board of Works having agreed to a resolution "That prizes be offered for public competition for designs showing the best mode of laying out the surface and subsoil of the new street in Southwark, as an example of a first-class street, and also for the street in Westminster as a second-class street, showing the disposition of the private vaults, sewers, gas, and water pipes, telegraph wires, with any parts of the soil appropriated to other useful purposes,"

The following prizes were offered:—

For first-class streets	100 guineas.
,, ,, ...	50 ,,
,, ,, ...	10 ,,
And for second-class street	50 ,,
,, ,, ...	20 ,,
,, ,, ...	5 ,,

In reply to the advertisement, thirty-nine competitors sent in designs, which are now being exhibited in the great room of the Society of Arts, by permission of the Council, and will remain on view till the 21st November.

The plans have been referred to a Committee of seven persons, consisting of four professional men, the Chairman, and two other members of the Board, assisted by the Engineer and Superintending Architect. Mr. Alderman Cubitt and Mr. Wright were the members to be associated with the Chairman, and Mr. R. Stephenson, Mr. T. Hawkesley, Mr. G. Lowe, and Mr. T. H. Wyatt constituted the professional members of the Committee.

The Committee report, that they have been assisted by J. W. Bazalgette, Esq., engineer, and Frederick Marrable, Esq., Superintending Architect to the Board, and have unanimously awarded the several prizes as follow:—

First-class Street.

Serial No.	Motto.	Name and Address.	Prize.
			Guins.
19	(Juvenis) Unus inter multos.........	H. D. Davis, 227, Maida-hill west	100
32	Strada nuova..............	James Thomas Knowles, 1, Raymond buildings, Gray's-inn........	50
11	Ferimur per opaca locorum	Frederick and Alfred Warren, Duke-st., Adelphi.	10

Second-class Street.

Serial No.	Motto.	Name and Address.	Prize.
3	Gracious be the issue ..	W. H Cullingford, 43, Pembridge-villas, Bayswater	50
26	Selim's Duplicate System	Wm. Reddall, 3, Chapel-place, Poultry	20
24	Aux grands maux les grands remèdes	Samuel Hughes and Geo. Hopkins, 14, Park-st., Westminster	5

The Committee add:—"The difficulties in the way of arriving at a satisfactory decision have been very great; no general principles were found to apply, nor was it possible either to approve or condemn all the parts of any of the designs submitted to competition. Your Committee have therefore selected those designs which appeared to them to be most susceptible of such practical adaptations as would render them most generally applicable to the circumstances of the metropolis."

The main object has been to devise such a system of subways between the surface of the streets and the sewers, as shall suffice for the arrangement of gas and water pipes, telegraphic wires, &c., so that they may be readily accessible for repairs, and that the constant disturbance of the roadways in the most frequented thoroughfares may for the future be obviated. Most of the competitors propose the construction of a continuous vault or passage, about six feet in height, under the centre of the roadway in each street along which the water-pipes, gaspipes, and telegraphic wires can be carried, and from which ready access can be gained to the sewers beneath. In some of the designs the main waterpipes are placed on each side of the vaulted passage, the gaspipes being above or below them, while in others the waterpipes are arranged on one side the subway and the gaspipes on the other.

Mr. Davis, to whom the first prize was awarded, proposes the formation of a continuous subway or passage, about 9ft. in width, under the centre of the road, and above the sewer. On either side of this passage would run the water mains, and above them, supported upon stone corbels, the gas mains. He proposes that the vaults should be constructed the whole length of the street on either side of the passage, and observes that this system would afford increased cellarage to the houses—an important consideration to business quarters of the city. The subway would be wide enough to allow a man to walk in the centre, and the gas and water-pipes would be fixed in such a manner that they would be easily accessible for repairs. The telegraphic wires would be carried along the subway on projecting stone corbels. Entrance to the subway would be obtained by vaults reserved at the intersections of streets at distances of about 400 yards. If this plan were carried into effect any disturbance of the surface of the roadway, unless for the purpose of renewing it, would seem to be unnecessary. The cost of its adoption, including vaults for the houses, would be £36 per lineal yard, or about £10 per yard more than the cost of the ordinary system.

Mr. Knowles, who gained the second prize in the first class, proposes the formation of a central subway, 15ft. in width, with vaults on either side, the expense of the construction of the side vaults being defrayed by the owners of buildings fronting the street. He recommends that ventilating shafts for the main sewers, to be carried sufficiently high to discharge all noxious gases into the atmosphere above the surrounding housetops, should be provided at the intersections of streets at certain intervals. The estimated cost of this plan for first-class streets would be £22 14s. 7d. per lineal yard, exclusive of the expense of constructing the private vaults, or £16 5s. 7d. per yard for second-class streets.

The first prize in the second class was obtained by Mr. Cullingford, who proposes the formation of a passage over the main sewer, along which the pipes for the supply of the water and gas and the telegraphic wires can be fixed. He suggests that the sewers and passages should be ventilated by means of flues, carried into the chimneys of each alternate house, side by side with the kitchen flues, with which they should be carried up to the top of the building. The cost of this design applied to a first-class street is estimated at £15 per lineal yard, or £12 per yard for a second-class street.

Mr. Reddall, who gained the second prize in the second class, suggests the formation of a continuous passage below the footpaths, of sufficient capacity to contain the water and gas pipes, and to allow workmen to perform all necessary repairs and alterations. He also recommends means for preventing the escape of the effluvium from the sewers, and proposes a system of ventilation very similar to that suggested by Mr. Cullingford. The estimated expense of carrying out this plan would be £23 per lineal yard for a first-class street, and with slight modifications the system would be applicable to second-class streets.

ARSENIC IN PAPER HANGINGS.

Dr. Alfred Swaine Taylor, in his evidence before the Select Committee of the House of Lords, last session, on the "Sale of Poisons' Bill," after pointing out that arsenic was much used in several manufactures, such as in the manufacture of glass, especially opal glass, of shot, in the steeping of grain, and in killing the fly in sheep, states that the largest quantity of arsenic used in this country is used in the manufacture of paper for covering walls. He considered it very injurious both to those living in houses papered with this article, as well as to those employed in the manufacture. An instance was published in a medical work of some cases of illness occurring to persons living in a room papered with this paper, and the effects were described as those arising from arsenic. Dr. Taylor had no doubt that the injurious effect arose from this cause, and referred to two cases which had been communicated to him, from Somersetshire and from Birmingham. The colour, he says, is put on very loosely indeed; it contains nearly fifty per cent. of the poison, and he believes that there are many cases of illness occurring to persons living in rooms papered with this kind of paper. It is used in the case of both cheap and dear papers. The colour is permanent, and that is why it is selected for use. It is used in both the light and dark greens, but chiefly in the light. In the cases to which Dr. Taylor referred, the effects produced were constriction of the throat, nausea, loss of appetite, tingling numbness in the extremities, and severe headache. The only contact between the individuals and the poison was that arising from the ordinary dust collecting in the room. Dr. Taylor was informed that the gentleman and his wife sat in the room for a length of time during the day, and burnt gas in it at night, and were unable to account for their illness. Dr. Hinds, of Manchester, advised the parties to go to the sea-side; they went, and recovered their health, but on returning home, they again became ill, and the symptoms being similar to those resulting from arsenic, Dr. Hinds was led to tear off a portion of the paper, and send it up to town for examination, when arsenic was detected. In Prussia, papers of this description are not permitted to be sold. Green copper colours containing arsenic are subject to control, and are not permitted to be sold as water or oil colours, for painting in-door work or printing paper-hangings. If found on the premises of dealers in the latter articles, they are confiscated, and the owner is punished by fine or imprisonment. After the publication of the Birmingham case, Dr. Taylor received the following letter:—

"I venture to take the liberty of forwarding some green flock paper—and shall be particularly obliged if you would inform me if there is any arsenite of copper in the green flock of it. A friend, and patient of mine, who spends a considerable part of the day in a room lately hung with it, has been suffering for some time past from irritation of the throat and chest, and I should at once order the paper to be removed should there be anything injurious about it."

He examined the paper, and found arsenic in it.

Dr. Taylor handed into the Committee an envelope, the green tint on the inside of which he had examined, and found to be formed of arsenite of copper.

There is also an orange-yellow which contains arsenic, but not so commonly used as the green. In the shops where it is sold, Dr. Taylor was told that although it was known to be dangerous, it was valued for the colour not fading, and it was found to show off optical and other instruments better than any other colour. Dr. Taylor related that, on one occasion, he had a loaf of bread served on his table at breakfast, the bottom crust of which contained this arsenite of copper. He afterwards traced it to the baker's shop, where he found that the baker had had his shelves papered and the shop re-decorated with this obnoxious paper, and there were something like 150 loaves placed upon the shelves in contact with this arsenite of copper. He considered it a most dangerous substance to be used in the free way in which it is, and that some such control as that in Prussia should be adopted, and other colours used instead.

GAS-FLAME FURNACE.

The following is extracted from the *Mechanics' Magazine*:—

M. Guesnet, Admiralty Engineer, and M. Sochet, Director of Naval Construction, both of Cherbourg, France, have made a report upon a gas-flame furnace, the invention of M. Beaufumé, from which we condense the following information:—

In accordance with an agreement dated 23rd Feb., 1856, M. Beaufumé delivered at the port of Cherbourg a heating apparatus constructed according to his new system. This apparatus had been applied to the boiler of the Northern Forge at that port, where experiments were made with it.

Instead of burning the fuel directly below the boiler, M. Beaufumé first transforms it into gas in a separate apparatus; and then conveys this gas to the boiler, where its complete combustion causes the generation of the steam. This separate apparatus, which M. Beaufumé terms a gasifier, consists of a furnace constructed very like that of a locomotive, with a water-space substituted for the tube-plate. Coal is heaped upon the fire bars to a considerable height: say 20 to 28 inches, according to the quality of the coal. The air necessary for the gasification is supplied in suitable quantities below the fire bars, by means of a blowing fan. The oxygen of the air supplied causes very active combustion amongst the lower layers of coal in contact with the fire bars, converting the coal into carbonic acid gas; and this gas in passing through and amongst the upper layers, which ought always to remain black, becomes converted into carbonic oxide and accumulates in the upper part of the furnace mixed with nitrogen, and doubtless hydrogen also. These gases, the temperature of which is but slightly elevated, are conducted to the boiler through a wrought iron pipe, and enter the boiler furnace after having been thoroughly mixed, in a chamber termed the burner, with a suitable proportion of air supplied by the blowing fan. After having been once ignited in the boiler furnace, the gases continue to burn as fast as they are supplied. The flames produced act on the heating surface of the boiler; and the gases remaining after combustion pass through the flues and escape into the atmosphere under the pressure due to the blowing fan, no chimney being required.

The gasifier, in consequence of the water space with which it is surrounded, is itself a small boiler, the water in it absorbing the heat developed in the gasifying process, and utilizing it by forming a considerable quantity of steam, which is added to that of the large boiler. The furnace of the gasifier is supplied with fuel through a passage in the top of the apparatus, this passage crossing the steam space and opening into the furnace, whilst it is fitted with doors or valves at both extremities, so that the fuel can be introduced into the furnace without opening a communication with the atmosphere.

A few simple and inexpensive alterations require to be made in the brickwork setting of ordinary boilers in order to adapt them for being heated by gas. The fire bars being removed, a brickwork platform is constructed in their place, and on this platform a number of brickwork passages are formed, with openings arranged to allow a portion of the ignited gases to come directly into contact with the boiler surface. These passages are quite indispensable, and form what may be called a heat regulator. They heat the gases, which arriving in too cold a state would not be completely burnt did they not come in contact with highly-heated surfaces before being ignited.

The boiler of the forge is of 12 horses power; it has a total heating surface of 167½ square feet, and when arranged in the ordinary way, it has a grate surface of 12¼ square feet.

The gasifier supplied by M. Beaufumé has a grate surface of 5¼ square feet, and a depth of fuel of 27½ inches can be placed in it. The total height of the apparatus, including the ash-pan, &c., is 11½ feet; and, taking extreme external measurements, the space occupied amounts to 290 cubic feet. To place the apparatus, and to allow sufficient room for attending to it, a space measuring at least 10 feet by 6½ feet is required, without including that taken up by the blowing fan and the donkey engine which drives it. The cylinder of the donkey engine is 3.9 inches diameter, and the stroke 7.9 inches; whilst the maximum speed is 170 revolutions per minute with a pressure of five atmospheres, the blowing fan being made to turn at the rate of 1,000 revolutions per minute, by a belt and pulley. The blowing fan is two feet in diameter by one foot in width, and the pressure of the blast produced when the fan makes 1,000 revolutions per minute is equal to a column of water 1.97 inches high.

The Beaufumé apparatus requires more attention, and gives perhaps a little more trouble than an ordinary boiler; still an ordinary fireman is quite capable of attending to it.

When the boiler and gasifier are cold, that is, when the fire has been extinguished for more than twelve hours, it requires considerably more time to get up the steam than with the ordinary furnace—about 25 minutes. At the same time, when the fire in the gasifier can be kept in during the intervals between working hours, as M. Beaufumé proposes, this inconvenience does not exist.

The Beaufumé apparatus has also another inconvenience, which is felt every time the fuel is stirred. This operation necessitates the opening of small apertures for the introduction of the poker, permitting large quantities of carbonic oxide to escape, the presence of which in the boiler house is injurious to the fireman, unless the atmosphere is renewed with sufficient rapidity.

Finally, there are minature explosions which take place on igniting the gases in the boiler furnace, when the precaution is not taken of shutting off the supply of air until the moment when the light is applied, and when in consequence the furnace and flues are filled with carbonic oxide mixed with air. There is, however, not the slightest danger attending these explosions.

In order to obtain a standard for comparison, preliminary experiments were made with the boiler heated by the ordinary furnace, to ascertain what quantity of steam per lb. of coal could be raised under these circumstances. The brickwork was in rather a bad condition, and only 4.85 lbs. of water were converted into steam of a pressure of five atmospheres per lb. of Newcastle coal.

When employing the same coal, on applying the Beaufumé apparatus, the quantity of water converted into steam of a pressure of five atmospheres per lb. of coal, which was increased at each experiment in consequence of repeated improvements in the working of the apparatus finally reached 8.26 lbs. This shows that the Beaufumé apparatus realizes a saving in fuel of 41 per cent. in the production of a given amount of steam. It is, however, necessary to make a deduction for the steam used by the donkey engine driving the blowing fan, which reduces it to about 7.8 lbs., a result which still shows a saving of 38 per cent.

In these two series of experiments the production of steam was estimated by the quantity of feed water used —doubtless a very imperfect method—but the only one at command.

During the whole of the experiments with the apparatus the consumption of smoke was complete, a very light smoke only being seen to issue from the chimney when the fuel was stirred, caused by the temporary production of an excess of gas compared with the air supplied. This smoke was almost imperceptible, and moreover lasted but for an instant.

During this series of experiments it was ascertained that the temperature of the residuary gases on leaving the flues was still sufficiently high to melt zinc; there was, therefore, undoubtedly, a considerable loss of heat, as these gases should not have had a temperature of more than 150° Centigrade (302° Fahr.) This arose in consequence of the heating surface being insufficient.

Further experiments were made with the Beaufumé apparatus, but with other than Newcastle coals, in all cases giving very advantageous results.

TRANSIT BETWEEN PARIS AND LONDON.

The following is extracted from the City article of the *Times* of Tuesday last:—

"It appears that the India mail, *viâ* Marseilles, consisting of 33 boxes, was conveyed from Paris to London in a little over eight hours on Thursday last, *viâ* Boulogne and Dover, by special trains and steamer. This is the quickest transmission of a mail that has ever been effected from Paris to London."

SUBMARINE CABLES.

A numerous meeting of engineers was held at the Town-hall, Manchester, on Wednesday morning, to receive from Mr. John De la Haye (of the firm of De la Haye and Bloom) an explanation of a new invention for which he has taken out a patent, for submerging submarine electric cables. Mr. Richard Roberts presided, and Mr. De la Haye said his attention had been drawn to the subject by the failures in laying the Mediterranean and Atlantic telegraph cables. The plan he would adopt would be to encase a cable, prepared like that for the Atlantic Ocean, in a soluble compound (the composition of which he would not now mention), capable of floating it for a time on the surface of the water. The coating he proposed to use for this purpose he supposed would hold it on the surface of the waves, whilst about five miles of cable were paid out from the vessel, before it began to dissolve, and as it would dissolve gradually, so the cable would sink gradually to the bed of the ocean. By this means he calculated that there would always be about five miles of cable lying on the surface of the water in the wake of the vessel, and the remainder would describe an incline to within one or two hundred feet of the bed of the ocean, so that there would be comparatively little strain, and consequently less liability of breakage. The cable would descend into the ocean almost horizontally, instead of nearly perpendicularly.

SOUTH KENSINGTON MUSEUM.

During the week ending 17th October, 1857, the visitors have been as follows:—On Monday, Tuesday, and Saturday (free days), 2,856; on Monday and Tuesday (free evenings), 5,686. On the three students' days (admission to the public 6d.), 594. One students' evening, Wednesday, 171. Total, 9,307.

Proceedings of Institutions.

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Portsmouth and Portsea.—The report of the Literary and Philosophical Society for the past year states that there has been an increase in the number of members, and in the average attendance at the lectures and public discussions. It was the earnest desire of the committee to announce in their programme for the session a course of illustrated scientific lectures, but this much desired object was unattainable; however, arrangements are now in progress for its accomplishment. The practicability of extending the operations of the society by combining class instruction with systematic courses of lectures has engaged the attention of the committee. A detail of the Society of Arts scheme of examinations was given at one of the ordinary general meetings, when a resolution was unanimously passed to the effect that, taking into consideration the great value of the certificates granted, and of the prizes awarded, by the Society of Arts, to those candidates who pass a successful examination, it would be advantageous to establish preparatory classes for students who might be desirous to become candidates at the examinations. Several gentlemen present having expressed their willingness to conduct classes when formed, a circular was issued to the members, stating that instruction would be given in the following subjects:—Mathematics, mechanics, physiology, botany, writing from dictation, English history, and Latin. During the past year the committee received a communication from the committee of the Athenæum, proposing that deputations from the society and from the Watt Institute should meet the committee of the Athenæum, to consider to what extent the three societies might be enabled to co-operate, with a view to increase the interest and effectiveness of their proceedings. The invitation was accepted, and several meetings were held, at which resolutions in favour of the principle of co-operation with reference to the contemplated classes, the library department, and the arrangements for courses of lectures on various branches of science, were passed, as well as suggestions as to the propriety of making in concert such arrangements for the formation of museums as would have for their object only the illustration of the said various branches of science. The following lectures have been given during the past session:—Dr. Engledue, "Human Physiology;" Mr. H. Hobbs, "Society of Arts Examinations;" Dr. Baikie, R.N., "The Recent Discoveries in Central Africa;" Mr. J. C. Buckmaster, "The Electric Telegraph;" Mr. J. Bennett, F.R.A.S., "The History, Construction, and Manufacture of a Watch;" Rev. E. G. Holland, "American Scenery;" Mr. Rawson, "A Working Model of a Marine Steam Engine;" Rev. H. A. Plow, B.D., F.S.A., F.R.A.S., "The Plurality of Worlds;" Mr. Hamilton, "The Colonies;" Mr. G. Garnett, "The Construction and Management of Steam Boilers; and the Causes and Prevention of Steam Boiler Explosions;" Mr. J. Bennett, F.R.A.S., "Women and Watch-work;" Mr. Harrington, "Systematic Philosophy, including new Theories of Light and Heat;" Mr. Spence, "The Bessemer Process of Manufacturing Iron;" Rev. R. K. Edwards, B.A., "Photography;" Mr. Stockman, "The Mother Tongue of England;" Mr. H. Wood, "The General Features of Portsmouth Harbour;" Mr. Hamilton, "The British Colonies;" Mr. H. Wood, "The General Features of Portsmouth Harbour;" Mr. G. Garnett, "Water: its Chemical, Geological, and Mechanical Relations; with especial reference to the Borough of Portsmouth Improved Water Supply;" Mr. J. Ellis, "Mental Calculation;" Rev. J. Power, M.A., "Infusorial Life, or Some of the Marvels of the Microscope." Several donations have been made to the library during the past year.

Wakefield.—The annual general meeting of the Mechanics' Institution, was held on Wednesday evening, August 26th, Col. John George Smyth, M.P. (the President), in the chair. The honorary secretary, Mr. John Lockwood, read the report, which congratulates the members on the continued prosperity of the Institution, and shows that the past year has tended more fully to confirm its position as an educational society. The number of members is 822 as compared with 812 last year. The following lectures have been delivered, and were very well attended:—E. A. Leatham, Esq., M.A., "A Talking Lecture on his Recent Trip to the East; Mr. Edmund Wheeler, London, "The Curiosities of Insect Life," (2nd lecture); Mr. Barnett Blake, agent and lecturer to the Yorkshire Union of Mechanics' Institutions, "The Literary Beauties of the Bible;" Mr. J. White, Leeds, "The Advantages of Art Education;" Rev. R. S. Bayley, Hereford, "The Life and Poetry of Dante;" T. Brittain, Esq., Manchester, "Microscopic Demonstrations of the Animal Kingdom;" H. Munroe, Esq., M.D., Hull, "The Genius and Writings of Hood," (2nd series); G. Dawson, Esq., M.A., Birmingham, "Popular Proverbs, their Wisdom or want of it;" R. F. Horner, Esq., M.D., "Travels at Home;" Rev. W. R. Bowditch, "The best means of raising Mechanics' Institutions to their true Educational Position;" Rev. R. Bruce, M.A., Huddersfield, "The English Universities, especially in their relations to the Working Classes;" Rev. E. Mellor, M.A., Halifax, "On his Tour in Switzerland;" Mr. J. Richardson, Hull, "The Oracles and Necromancy of the Ancients, contrasted with the Fortune-telling, Clairvoyance, &c.. of the Moderns," Illustrated; Mr. D. Dean Calvert, Morley, "A Labourer's Thoughts on Life, Labour, and the Pursuit of Knowledge;" Professor H. P. M. du Gillon, Bradford, "A History of French Literature;" Mr. Amos Maudsley, Nostell, "Adoration, its Philosophy and Poetry;" Leo H. Grindon, Esq., Manchester, "The Analogies between Animals and Plants," illustrated; R. Baker, Esq., Leeds, Inspector of Factories, "The History of a Beer Barrel;" W. R. Milner, Esq.; Rev. H. S. Brown, Liverpool, "Æsop's Fables;" Rev. R. Harley, F.R.S.A., Rastrick, "The Power of an Idea;" Rev. W. R. Bowditch, "Fire-damp and its Causes," Illustrated by specimens and drawings; Rev. H. Batchelor, Sheffield, "The Varieties of the Human Race;" G. W. Harrison, Esq., "Reminiscences of the Rhine and Switzerland, in 1855;" Rev. J. S. Eastmead, "Robinson Crusoe, and the man who wrote it;" Rev. J. Stuchbery, B.A., "Sir Isaac Newton;" Rev. J. B. Paton, M.A., Sheffield, "The Brothers Bethune;" Rev. T. Hincks, B.A., Leeds, "A Day by the Sea-side." Illustrated by specimens and drawings. The library has been increased by the accession of 315 volumes, making an aggregate of 4,667 volumes. Agreeably to an arrangement made with the Corporation, copies of the Commissioners' Specifications of Patents have been confided to the keeping of the Institution, and will be arranged in a separate room, for convenience of general reference by the public. The Committee, observing the increased importance now attached to class instruction, and feeling the impetus given to this department of Mechanics' Institutions by the Society of Arts Examinations, is desirous of forwarding the movement in favour of direct and systematic teaching, and trusts that this will receive that consideration from the new committee that its importance demands. The following shows the number of Pupils on the class books, and the average attendance:—

	Number of Pupils.	Average Attendance.
Elementary Classes, (Males,)	190	50
Do. (Females,) ...	65	13
Grammar Class	18	11
Free-hand Pencil Drawing	8	4
Practical Art Class	14	12
Total	295	90

In the month of April, a Board of Examiners having been appointed for that purpose, the whole of the classes were examined, and, at a meeting afterwards held, 91 certificates and 4 prizes were awarded. The elementary classes were examined in arithmetic (by means of printed questions), writing from dictation, and reading. The grammar class was examined orally. The drawing and practical art classes by printed papers, requiring certain geometrical definitions, and the working of the problems given, and also by an inspection of the drawings. These examinations, whilst devolving considerable labour on the conductors, are found to have a most evident and beneficial influence; giving a decided stimulus both to teachers and pupils. The Natural History department has held its meetings on each alternate Friday evening; a series of excursions have also been made to various places in the neighbourhood during the summer months. A cabinet has been purchased by a special subscription, and various valuable donations of fossils, plants, insects, birds' eggs, &c., &c., have been presented by the members and their friends, and further contributions are invited. The department numbers 30 members. The penny savings bank connected with the Institution, has met with much success, the amount received during the past year being £565 1s. 1d., in 10,166 deposits. With reference to the Society of Arts examinations, a preparatory class was established early in the Session for those members who purposed offering themselves as candidates, and a separate class room, furnished with all the text books required, was set apart for their accommodation, every effort being made to ensure their success. The committee also took the initiatory steps for the appointment of a Local Board of Examiners for this district. The result of the examination shows that only one of the candidates failed in securing a certificate. At the Normanton branch, the number of members has advanced from 46, as stated in the last report, to 94. 400 books have been purchased as a permanent library, the supply from the general library being still continued as formerly. The issue of books has been greater than last year. The following lectures have been given at Normanton:—W. R. Milner, Esq., "The Human Frame," (2 lectures); Mr. B. Lee, A Reading, "The Lady of Lyons;" Rev. E. Higginson, "Plurality of Worlds;" Rev. W. Mason, "Louis XVI. and Marie Antoinette," (2 lectures); Mr. A. Ash, "A Glance at the History of Music;" Mr. B. Blake, "Celebration of Christmas;" Samuel Payne, Esq., "Work and Working Men;" Mr. I. Mason, Reading, "Henry the Eighth."

Miscellanea.

New Mode of Curing Bacon.—The firm of Henry Denny and Son, of Waterford, have fitted up a portion of their premises for curing bacon with ice; and by means of this plan they are said to be able in the warmest part of the year to send mild cured bacon quite sweet to the English market. When the pigs are killed and cut up, they are placed on benches in large underground cisterns, rendered water-tight, and subjected to the action of pickle cooled with ice, which is renewed so as to keep it at a low temperature, and after three weeks' treatment the bacon comes out perfectly cured, hard and sweet.

PATENT LAW AMENDMENT ACT.

APPLICATIONS FOR PATENTS AND PROTECTION ALLOWED.

[*From Gazette, October* 16.]

Dated 12*th June*, 1857.

1648. Jules Clovis Dieulafait, Paris—An improved method of manufacturing garments, whereby one garment may be changed in form to that of several others.

Dated 15*th June*, 1857.

1670. William Smith, 10, Salisbury-street, Adelphi—Improvements in chromotypographical printing presses. (A communication.)

Dated 11*th July*, 1857.

1938. Hippolyte Lamy, Paris—An engine or apparatus for obtaining motive power by an improved method of applying steam, gas, or heated air.

Dated 25*th July*, 1857.

2032. William Johnson, Stockport—Improvements in looms for weaving.

Dated 25*th August*, 1857.

2243. John Gedge, 4, Wellington-street South, Strand—Improvements in envelopes for letters and other documents. (A communication.)

Dated 7*th September*, 1857.

2336. Uriah Scott, Camden-town—Improvements in boots and shoes, applicable in part to shoes for horses.

Dated 10*th September*, 1857.

2353. Henry Lawford, 31, Berners-street—An improvement in the manufacture of dining tables expanding and contracting tops, applicable also to other expanding and contracting planes.

2354. John Leslie, Glasgow—Improvements in carding or preparing textile materials. (A communication.)

Dated 11*th September*, 1857.

2368. William Porter McCallum, Birmingham—Improvements in machinery used for stamping or raising metals.

Dated 12*th September*, 1857.

2379. William Gossage, Widnes—Improvements in the manufacture of soda and potash.

Dated 14*th September*, 1857.

2380. Thomas Waterhouse, Claremont-place, Sheffield—Certain improvements in machinery or apparatus for applying steam and atmospheric air to actuating and governing forge and other hammers.

Dated 17*th September*, 1857.

2413. Hugh Greaves, New Palace-yard, Westminster—Improvements in constructing the permanent ways of railways.

Dated 18*th September*, 1857.

2426. David Lichtenstadt, Castle-street—Improvements in the manufacture of pulp of which paper and other fabrics are composed.

Dated 28*th September*, 1857.

2490. Robert Kay, Castleton Print Works, near Rochdale—Improvements in machinery or apparatus for printing calico and other textile fabrics.

2492. William Bestwick, Salford, near Manchester—An improved material suitable for skirt springs and other similar purposes.

2494. Richard Quin, 5, Rodney-street, Pentonville—Improvements in the construction of cases suitable for containing photographic and other pictures.

Dated 1*st October*, 1857.

2519. James Ward, 36, Church street, Liverpool—Improvements in pumps applicable for mines, ships, and other purposes.

2521. Evan Leigh, Manchester—Certain improvements in machinery or apparatus used in spinning and preparing cotton and other fibrous substances, parts of which are also applicable to machinery or apparatus generally.

2523. James Murdoch Napier, Vine-street, York-road—Improvements in printing machines.

Dated 2*nd October*, 1857.

2525. Luigi De Cristoforis, Milan—Regulating the ascent and descent of the railway locomotives on inclined planes, which is to be called the De Cristoforis ascending and descending locomotive apparatus.

2527. Alfred Illingworth and Henry Illingworth, Bradford, Yorkshire—Improvements in machinery or apparatus for combing wool and other fibrous substances.

2529. John Sweet Willway, Bristol—An improved apparatus to act as a gas valve.

2531. Peter Kerr, Paisley—Improvements in preparing and finishing threads or yarns.

2533. Alexander Macpherson, Carstairs, Lanark, N.B.—Improvements in the manufacture of fences.

Dated 3*rd October*, 1857.

2535. Robert Green, Crawshaw Booth, near Rawtenstall, Lancashire—Improvements in raising or forcing liquids.

2537. William Riley and Thomas Riley, Greetland, near Halifax—Certain improved means, machinery, or apparatus for "saving" or covering the lists of textile fabrics previous to the dyeing of such fabrics.

2559. George Chowler, Dippertown, Lewdown, Exeter—Improvements in the arrangement and construction of fog, wreck, and other buoys.

2541. William Edward Newton, 66, Chancery-lane—Certain improvements in machinery for making mould candles. (A communication.)

2543. John Stobbs, Sidney street, North Shields, and George Roger Hall, Linskill-street, North Shields—Improvements in pumps for raising water and other liquids.

Dated 5*th October*, 1857.

2545. John Rubery, Birmingham—Improvements in the manufacture of certain parts of umbrella and parasol furniture.

2547. William Richardson, 5, Ranelagh-grove, Pimlico, and George Richardson, 2, Copenhagen-street West, Islington—Partly or wholly stopping wheels of carriages of every description when in motion, and such break or breaks to be applied by the motive power.

2549. George Davies, 1, Serle street, Lincoln's-inn—Improvements in the combustion of coal without smoke, which improvements are also applicable to the combustion of other kinds of fuel. (A communication.)

2551. Louis Beckers, New York—Improvements in apparatuses for exhibiting daguerreotype, photographic, and other stereoscopic views and pictures. (A communication.)

2553. John Penford Harvey, Spalding, Lincolnshire—Improved machinery for crushing land or clods.

WEEKLY LIST OF PATENTS SEALED.

October 16*th*.

1074. Thomas and Frederick Sugden.
1076. William Weild.
1077. Robert Hindle.
1094. Thomas Harris.
1098. William Henry Dearing Granville.
1107. John Cowdery Martin.
1112. John Underwood.
1211. Frederick Walton.
1212. Frederick Walton.
1216. Thomas Baldwin.
1235. Edward Tucker.
1304. Théodore Lipkau.
1317. Robert Wilson.
1321. John Miller.
7361. William Hyde and Joshua Hyde.
1438. John Wesley Hackworth.
1470. John Crossley.
1512. Alfred Vincent Newton.
1949. William Edward Newton.

October 20*th*.

1135. Gerolamo Cavanna.
1138. William Robertson.
1146. George Scarr and James Pollard.
1148. John Garnett.
1152. Albert Demerit Bishop.
1160. William Clark.
1162. Thomas Craddock.
1167. Samuel Sunderland and Richard Dean.
1168. Edmund Winder Otway.
1170. Thomas Mann.
1186. Alfred Eddington.
1214. Lucius Henry Spooner.
1220. Charles Cammell.
1242. Joseph Seelic Greenhow.
1264. Juste Herrero.
1300. William Colborne Cambridge.
1322. John Miller.
1354. Michael Henry.
1522. Peter Armand le Comte de Fontainemoreau.
1934. John Loach, James Jones Salt, and Burton Day.
1966. Edmond Bertin.
2168. Frederick Lipscombe.

Patents on which the Stamp Duty of £50 has been Paid.

October 13*th*.

2196. Anthony Bernhard Baron von Rathen.
2197. John Coope Haddan.

October 14*th*.

2221. Alfred Illingworth and H. Illingworth.
2261. Charles Cowper.

October 15*th*.

2234. Robert Walter Winfield.

October 16*th*.

2236. Samuel Mason and William Beeby.
2238. John Platt.
2239. Thomas Biggart and Allan London.
2311. William Reid.

October 17*th*.

2237. Peter Armand le Comte de Fontainemoreau.

WEEKLY LIST OF DESIGNS FOR ARTICLES OF UTILITY REGISTERED.

No. in the Register.	Date of Registration.	Title.	Proprietors' Name.	Address.
4027	Oct. 16.	Buckle	Dain, Watts, and Manton..........	Birmingham.

Journal of the Society of Arts.

FRIDAY, OCTOBER 30, 1857.

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MARINE ALGÆ.

The following letters upon this subject, from His Excellency Sir John Bowring and Dr. Macgowan, have been received by the Secretary. Notice of the arrival of the specimens alluded to will be given in the *Journal*:—

"Government House, Hong Kong, Aug. 27, 1857.

"My Dear Sir,—My friend, Dr. Macgowan, of Ningpo, has requested me to be the channel of conveying to your Society a box of specimens of algæ, which he hopes may be deemed of some interest in reference to the inquiries in which you have been engaged. He is a very diligent man and useful missionary, and has made several valuable contributions to scientific knowledge. I shall always be most happy to render you any services in these regions.

"I am, &c., "JOHN BOWRING."

"Ningpo, July 25, 1857.

"My Dear Sir,—The receipt by last mail, in regular course, of the Journal of your Society, seemed to remind me that my indebtedness for the favour has got beyond my means of requital. However, observing in it the announcement that you had offered a Prize for essays on edible algæ, it occurred to me that I might do a mite of good by sending for inspection some specimens of alimentary algæ used in this part of China. Through the kindness of His Excellency Sir John Bowring, I send several algæ, which I suggest may be submitted first to some botanical authority on that order of plants, and then to some analytical chemist, so that the results may be availed of by the competitors for the prizes, or that the information may be turned to account in connection with the subject on which you have invited inquiry. The most important is the

"1. *Tan-shwui* grass, so named from the place, on the coast of Formosa, whence it is procured. It is used for making *Yang-tsai* (ocean vegetable), No. 8.

"2. *Niu-mau* (Ox-hair) grass, made into an iced jelly, and sold in the streets in hot weather, sugared.

"3. *Hâi-tâi* (Sea-tape), sent into the interior, wherever fossil coal is used. It is considered corrective of the deleterious exhalations of that fuel. It is usually boiled with pork. This kind comes from Shantung province.

"4. *Tsz'-tsai* (Purple vegetable).—Often eaten as it is, to give relish to rice, or cooked.

"5. *Fah-tsai* (Hair vegetable).—Boiled, either with animal or vegetable articles, forms a broth. Also the gills eaten with sugar.

"6. *Ki-tsai* (Henfoot vegetable).—Cooked with soy or vinegar. Used by women to make the hair glossy and to strengthen it.

"7. Sea-tape, from Japan. It is preferred to the former.

"8. *Yang-tsai* (ocean vegetable); the article marked No. 1 (Tan-shwui grass), prepared. Within the past few years the Chinese have learnt the art of preparing this from the Japanese.

"As the box of specimens must be sent off before I can complete what I meant to say on these algæ, I must write again by next mail. Excuse abruptness.

"Very truly yours,
"D. J. MACGOWAN."

TONNAGE REGISTRATION.

The following is the report by Mr. Charles Atherton, Chief Engineer of Woolwich Dockyard, to the Committee appointed by the British Association, to inquire into and report on the deficiencies of tonnage and engine-power registration:—

1. The objects of public utility, fiscal, mercantile, scientific, and statistical, sought to be attained by the tonnage and engine-power registration of shipping, or which registration may be expected to subserve, are presumed to be as follows, namely:—

To constitute the base on which *fiscal or government dues* and other dues, so far as leviable on shipping, such as light dues and pilotage, river improvement, and harbour and dock dues may be equitably assessed; also, in a *mercantile* point of view, the legalised tonnage of a ship may be expected, as heretofore, to constitute the base of the contract price for building, buying, selling, and chartering of ships, namely, at so much per ton. Tonnage is referred to in advertisements as designating the capabilities of a ship for cargo; the manning of ships is principally based on their tonnage, and in respect of naval architectural *science*, the immersed displacement of a ship being the only recognised measure of the total weight (including the ship herself), propelled by the power of wind or steam from place to place, is an important element which registration may be expected to supply; but tonnage, under the Act of 1854, being confined to internal measurement only, is, as respects external displacement, a delusive term, in so far that all terms made use of in science to signify quantity require to be definite, whereas tonnage does not embrace the external cubical admeasurement of a ship with reference to any determinate line of floatation; and as to engine-power, the "nominal horse-power" of a steam-ship is always registered as the engine-power, but there is no legal definition of the amount of power denoted by the term "nominal horse-power," and engineering practice has not prescribed or adopted any specific measure or definition of the nominal horse-power unit, so that the registered "nominal" horse-power defines nothing; and as scientific investigations into the relative merits and capabilities of ships, in a locomotive point of view, are based on the mutual relation of displacement (that is, the cubical admeasurement of the immersed portion of the hull), propelling power, and the speed attained, it follows that the present registration of shipping, as respects their tonnage and nominal horse-power, affords no definite measures of quantity, either as to ship or engines, available as data for judging, on scientific principles, of the relative dynamic capabilities of steam-ships, thereby comparing the dynamic merits of different types of build. As respects *statistics*, some of the statistics of trade, such, for example, as the gross amount of the imports and exports between Great Britain and other countries during any particular year, are based on the aggregate tonnage of the shipping that may enter and leave Great Britain during that time (see Trade and Navigation Returns for the year 1856); and tonnage, under the Act of 1854, not being based on those measurements of external displacement that would give the capability of a ship for carrying weight of cargo, it follows that statistics based on ships' tonnage do not indicate the amount of trade, as respects the weight of goods actually conveyed. It is submitted, that shipping registration would be greatly improved if it afforded data available for the purposes above referred to, embracing not only the capacity of ships for holding bulk, but also their capability for carrying weight.

2. The present system of tonnage admeasurement gives the space or roomage of a ship available for cargo in cubic feet, 100 cubic feet of such space or roomage for cargo constituting, under the Act of 1854, the unit of tonnage registration. Doubtless, this is an essential element of registration, but its utility would be greatly enhanced if the

capability of the ship for carrying weight were also known. The measurement which defines the weight of cargo with which a ship may be loaded, is the displacement contained between the plane of light draught floatation, when the ship is ready to receive her cargo, and the plane of deep draught floatation, or load line, down to which the ship may be safely loaded. This displacement, taken in cubic feet, and divided by 35 (there being 35 cubic feet of sea-water in a ton weight*), will give the capability of a ship for carrying dead weight, provided that the stowage thereof do not destroy the required stability of the ship; but neither this nor any other method of determining the capability of a ship for carrying weight is recognised or provided for by the present law, namely, the Merchant Shipping Act of 1854, for the internal roomage or bulk tonnage of *dissimilar* vessels bears no constant or definite ratio to their cargo displacement or weight tonnage above referred to.

3. As respects the mercantile utility of tonnage registration, it is presumed that the registered tonnage may be expected to constitute the legal recognition of the size and capability of a ship, by which alone all ships might be commercially advertised. For example:—

AUSTRALIA BLACK BALL LINE.

Lightning	2,090 tons register.
Joseph Tarratt	1,000 ,,

But what do we find to be the commercial practice under the present law?

The deficiency of the present system of tonnage registration for mercantile purposes is demonstrated, by shipping advertisements so frequently ignoring the register tonnage, as prescribed by the Act of 1854, some other denomination of tonnage being advertised in lieu of the legal or registered tonnage. For example:—

LINE OF SHIPS FOR AUSTRALIA.

Ganymede	2,000 tons burthen.
R. M. Mills	1,000 ,,

Again, tonnage is sometimes quoted without expressly saying whether tons register or tons burthen is meant. For example:—

NEW ZEALAND BLACK BALL LINE.

Alma	2,000 tons
Fortune	1,100 ,,

Sometimes both register and burthen are expressed, as for example, in the late advertisements of the Australia White Star Line:—

	Tons Register.	Tons Burthen.
Sardinian	1,150	2,000
Shalimar	1,600	3,000
Red Jacket	2,309	5,000
Golden Era...........	1,643	4,000
Mermaid	1,320	3,500
Anglo-Saxon	1,230	3,500

The average of these vessels gives the tons burden more than double the register tonnage (in the case of the *Anglo Saxon* it is nearly 3 to 1), and by an advertisement of the New Zealand line we have *Queen of Ava*, 450 tons register, 650 tons burthen, (the ratio of burden to registered tonnage in this case being only 1½ to 1). Thus we see that there is no constant ratio between the so-called tons burden and tons register, for, in the *Anglo-Saxon* the ratio of the so-called tons burden to the tons register is the double of what it is in the *Queen of Ava*. It is moreover to be observed, that even in the advertisements which give what is called the tons burden, the term burden does not mean (as one would naturally suppose) the tons weight of cargo that the ship will carry, nor has it any other definite signification as a measure of quantity either of weight or measure. It follows from the example above quoted, that the present official registration or registered tonnage of a ship does not fulfil the advertising requirements of trade, for, without reference to the ship herself, or to her former cargoes, or to her otherwise known character, the new registration affords no datum or approximately certain means of judging of the capabilities of a ship for carrying weight of cargo; it is only on the presumption of an advertised ship being approximately of certain guessed-at proportions, or build, at which merchants and shipowners generally from their own experience and knowledge of the reputed qualities of shipping, are acquainted with the ordinary carrying capabilities of ships in general, that any mercantile utility can be assigned to our present system of Tonnage Registration as indicating the weight carrying powers of ships. The very nomenclature of our present Tonnage Law is delusive, for the registration of a ship, though called "Tonnage," does not embrace its capability for carrying weight. Practically, the weight of goods has no constant ratio to their bulk, and the registered capability of a ship for holding bulk is essentially a totally different element from the capability of a ship for safely carrying weight. No one definition of tonnage, and no one mode of determining it, can adequately embrace both weight and bulk. The conditions of the problem, as respects weight and bulk, must be kept distinct; for example, if the capability of ships for the conveyance of *weight* cargo were termed the "Weight Tonnage," and the capability for holding bulk of cargo, termed the "roomage" or "bulk tonnage" (the unit of roomage or bulk tonnage being, say 100 cubic feet, as by the present law), the registration would then be tolerably complete for mercantile purposes, and what is here proposed to be called the roomage or "bulk tonnage" *would exactly correspond with the present register tonnage* as measured under the Act of 1854; for example, the registration of a ship might then be expressed as follows:—weight tonnage, say 100 tons; roomage or bulk tonnage, say 150 units of measurement. We should then know that the ship would hold a quantity of goods amounting to 150 units of measurement, each unit being 100 cubic feet, and that this gross quantity of cargo might consist of goods not exceeding 100 tons in weight; but whether fiscal or other dues, payable on this ship, should be rated on the 100 tons of weight tonnage, or on the 150 units of roomage or bulk tonnage, or on any specified combination of both, such as the mean, or, indeed, whether fiscal or any other dues should be charged on the hull of the ship at all without reference to the goods actually carried, are questions not referred for the consideration of this Committee, and on which, it is presumed, that the Customs-house authorities will be the best judges.

The present registration, based as it is on the roomage only, is manifestly deficient for the commercial purposes of regulating the adaptation, appropriation, and chartering of ships for the conveyance of weight; with some description of goods, a ship may be full without being half loaded as to weight, and with other descriptions of goods, a ship may be in a sinking condition without being half full; and since the registration does not set forth any of the principal dimensions, as length, breadth, depth, or load-line draught, or give the displacement, either at the launching draught, light draught, or load draught, or submerging draught, it cannot, on any definite principle, constitute the base of scientific inquiry into the comparative dynamic performances and merits of ships, nor can it constitute a reliable base for statistical inquiry into the imports and exports of the country as affecting goods of which the quantities are usually designated by weight, and which appear by the trade and navigation returns of 1856, to constitute no less than seven-tenths of the items of all the import and export trade of the country.

4. With reference to the assignment of some limit to

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* A cubic metre is 35⅓ cubic feet, very nearly; so that, if we make 35·5, which is the mean between sea and fresh water, the divisor, the cubic metre then becomes the unit of English weight tonnage.

the load-draught of water of ships, all constructors of shipping on scientific principles assign a deep draught water-line or constructors' load-line, with reference to which they determine the calculations of all the principal elements of the ship, in regard to her carrying capabilities. Since, then, the load-water line, or rather the deep draught floatation, constitutes an essential element of scientific naval architecture, it cannot be said the science of naval architecture would be interfered with by the constructors' deep draught of water forward and aft (or some line to be officially assigned as the load-limit,) being made an item in the official registration of every ship, and duly marked on the ship itself. It is presumed that the protection of life and property from wreck at sea, which would result from an authorised inspection and record of the draught at which ships actually put to sea, is as legitimate an object of legislative care as is the protection of life and property from the ravages of fire, by the official supervision of party walls instituted by building acts. In the case, however, of the builder of the ship, from any cause, assigning a deep-draught limit such as nautical science may not justify, it may be necessary to determine some rule whereby we may specifically assign the position of the statute nail or guage-mark to which the record of draught at which ships put to sea may have reference. The assignment of this statute guage-mark is a question of naval architectural science, on which, as an engineer, I do not put forward my opinions as having claims to authority, but, with deference to the professors of naval architectural science, I beg to observe as follows: I presume, to begin with, that there is some definite limit, such as some deck or port sill, or other limit, which constitutes the extreme immersion, beyond which a ship cannot be loaded in port or smooth water, without incurring the risk of filling and becoming water-logged or sinking. This limit may be called the line or plane of submergence; it is evident that such an immersion would be inadmissible for a sea-going ship, and the question is, within what limit may we approach the absolute sinking of the ship. The cubature of the upper portion of the vessel between the plane of submergence and the load-water line constitutes the surplus buoyancy on which we depend for safety at sea, and the question now is, by what rule shall we determine the position to be assigned to the load-water line below the plane of submergence—the distance between these two planes being usually called the "freeboard." In the first place, we may observe, that if the beam and draught of a ship be given, the freeboard will be somewhat dependent on the length of the ship, so that, when a ship is crossing a wave and on the crest of it, not supported by the extreme forward and aft bodies, she may not be overwhelmed amidships, the total displacement being always constant. Hence, the length of the ship requires to be noticed as an element in determining the freeboard. Secondly, if the length and draught be given, then the freeboard will be somewhat dependent on the beam or breadth of the ship—because ships, in lying on the side of a wave, or crossing a wave in an angular direction, or sailing on a side-wind, are subject to roll or lie over. In fact, ease of rolling constitutes one of the desirable properties of a loaded ship, and it is found from experience that an angular roll, of certainly not less than 24 deg., must necessarily be provided for, and this would give the freeboard amidships about 1-5th of the beam; consequently, the beam requires to be noticed as an element in determining the freeboard. Thirdly, if the length and beam be given, the freeboard will be somewhat dependent on the draught, because the deeper a ship is, *cæteris paribus*, the less easily will she rise to the sea, and, therefore, the more liable to be broke over at the bows or pooped at the stern, unless these tendencies be met by increased surplus buoyancy or freeboard in proportion to depth. Consequently, the depth of a ship also requires to be noticed as an element in determining the freeboard.

Hence, it appears that the length, breadth, and depth of a ship, from the keel up to the plane of submergence, are all of them elements to be noticed in determining the freeboard; and it is submitted that an investigation into existing practice as to the ratio which ordinarily exists between the freeboard and the length, breadth, and depth of the hull, will be the best means of deducing a rule for determining the distance in question. The proportions which I am now about to cite are given merely as an example of the inquiry proposed to be instituted. For example, a certain ship A, of which the approved freeboard is 5 feet, that is, of which the approved deep load water-line is 5 feet below the deck or plane of submergence amidships, measures, length 100 feet, breadth 30 feet, and depth from deck to the rabbet of the keel 20 feet. Now, if we take 1-20th of the length, 1-5th of the beam, and 1-5th of the depth, add them together, and divide by 3, the result will be $\frac{5+6+4}{3}=\frac{15}{3}=5$ feet for freeboard, and the mean deep draught will be 15 feet. Thus, by examining the relation that subsists between the freeboard and the dimensions of length, breadth, and depth, in a great variety of approved examples, we may practically determine some rule based on the length, breadth, and depth of a ship for assigning the position of the freeboard guage mark with reference to the plane of submergence. Again, for example, in illustration of the rule above set forth, if duly confirmed; suppose the length of a steam-ship B to be 300 feet, the breadth 30 feet, and the depth 20 feet, being the same dimensions as before, excepting the length 300 feet instead of 100 feet: in this case—

One-twentieth of the length....... = 15 feet
One-fifth of the breadth............ = 6 feet
One-fifth of the depth............... = 4 feet
And $\frac{15+6+4}{3}=\frac{25}{3}$ .... = 8 feet 4 inches

for freeboard. In this case, therefore, the freeboard will be 8 feet 4 inches instead of 5 feet, and the freeboard guage mark amidships will be at the draught of 11 feet 8 inches. As before stated, however, these assumed cases are given merely by way of illustrating a principle for determining a position for the freeboard guage mark before referred to, based on the dimensions of length, breadth, and depth, and with reference to which the draught at which ships put to sea may be officially recorded.*

As regards the regulations for enforcing the observance of such official rule as may be decided upon, it is submitted that the freeboard and draught, with reference to the said statute guage mark shall be items of the official registration of every ship, and that the officer whose duty it is to clear ships for sea shall take record of the actual load line with reference to the said statute mark at which ships actually leave port, and that in the case of loss of life or other damage at sea, a deficiency of freeboard shall be sufficient to cause special inquiry into the loading of the ship, and if blameable place the damage in the category of damage caused by neglect, and subject to the penalties in such case provided, as in the case of a deficient complement of boats or other regulation equipment. One of the most striking deficiencies of the Act of "1854" is the absence of all legislative provision whereby *proof* may be established of the condition as respects freeboard in which ships actually put to sea.

5. As to whether it is commercially equitable, or, in other respects, advisable to make a discriminative distinction between sailing ships and steamers in the measurement of the registered tonnage on which dues may be charged, it must be admitted, that all such

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* By the above rule a steam-ship 400 feet long, 40 feet broad, and 20 feet deep, measuring probably 2,000 tons register, would require a freeboard of 10 feet 8 inches, and would therefore probably have no displacement safely available for cargo beyond her own weight of hull and necessary equipment.

discriminations between one class of ships and another, however they may be assessed, are liable to be regarded as invidious, because they directly affect the pecuniary amounts with which ships are liable to be charged. Neither the weight tonnage nor the bulk tonnage appears to constitute an unexceptionable base on which to levy dues of all the various descriptions referred to. Dues to be equitable should be in proportion to the service actually rendered, and on account of which payment is enacted; for example, in the matter of pilotage, the service rendered is chiefly in proportion to the draught of water of the vessel. In the matter of harbour accommodation the service rendered is chiefly in proportion to the length of quayage occupied by the ship, and to the time the vessel remains in port. In the matter of lights, the service rendered is chiefly in proportion to the value of the property afloat. Doubtless, it may be convenient and most easy to assess all these diversities of dues arbitrarily on the registered tonnage of the ship, but such assessment cannot be said to be equitable. It may be observed that all matters touching the assessment of shipping dues, merit the exclusive consideration of a committee totally distinct from the question of registration, which this committee has been appointed to investigate.

6. As to whether it is equitable or advisable to make any discriminative distinction based on the materials, whether wood or iron, with which a ship is built, or on the different systems of machinery by which ships may be propelled, as is done by the act of 1854, on this point, I would beg to observe that the discriminations adopted by the present law appear to have been adopted as palliatives to mitigate the manifest defects inherent in the registration itself, whereby it has been vainly attempted to establish an analogy between internal roomage or capacity for bulk of cargo, and external displacement or capability for carrying weight of cargo. Let the registration be based on admeasurements comprehensively adequate to meet the requirements of the case, embracing both weight tonnage and bulk tonnage, and there will then be no occasion for discriminative protection in favour of any particular class of vessel, or description of material with which a ship may be built, or system of machinery by which a ship may be propelled. Let sail and steam, wood and iron, screw propeller and paddle-wheel, or water-jet, or any combination thereof, all compete on their own peculiar and intrinsic merits.

7. The registration of engine-power under the act of 1854 is in a condition perfectly analogous to the registration of tonnage. The nominal horse-power is registered, but there is no statute definition whatever of the measure of power which denotes the unit "Nominal horse-power," and no regulations have been prescribed by the Act of 1854, or any other Act, whereby the surveyors shall measure, estimate, or recognize, what they, or the makers or owners or engines, may please to call a "horse power." Neither the Admiralty rule or any other rule has been recognised by statute as the legal definition or measure of engine-power. The only definite measure of power generally recognised by engineers is, that the unit of power called "indicated" horse-power is equivalent to the power that would raise a weight of 33,000 lbs. 1 foot high in one minute of time; but this unit has never been recognised or legalised as the statute unit of power, nor has it been adopted in trade as the base of marine engine contracts. Incredible as this statement may appear, such is the fact. Whatever may be said as to tonnage registration being a delusion, engine power registration is equally so. For example, in a recent number of the *Times*, we see the following advertisement:—"Screw steam-ship for sale, 1,200 tons O.M, engines 100 H.P. Nominal, say 450 effective power."

Here the registered tonnage of the vessel is altogether repudiated. It may be only 500 tons register, though advertised as 1,200 tons O.M., and the engines of 100 h.p. nominal, at which they would be registered, are advertised as being 450 h.p. effective. No wonder, then, that the combination of tonnage and horse-power referred to in steam shipping affairs, and by which steam shipping is registered under the Act of "1854," so frequently subjects the most useful and the most laudable projects to directorial miscalculation as to the capabilities of ships, consequent private ruin, and public loss; for the failure of any private enterprise in steam navigation is undoubtedly a public loss. Now, as regards marine engineering, the first step next to that of comprehensive tonnage registration, is to obtain a legalised definition of power as the statute unit of power. Scientifically, it signifies nothing, excepting as respects convenience and usage, what measure of power may be fixed upon as the statute unit. It may either be equivalent to 33,000 lbs. raised one foot high per minute, being the measure known as the "indicated horse-power," or it may be equivalent to 132,000 lbs. raised one foot high per minute, being the average measure of power per nominal horse power actually supplied to government in the original equipment of the mail packets of the *Banshee* and *Lewellyn*, *Garland* and *Vivid* classes, or it may be equivalent to 100,000 lbs. raised one foot high per minute, being probably the average measure of power per nominal horse-power which, at the present time, constitutes the practice of trade in fitting out the superior classes of mercantile steam ships. As to any preference being given to any particular measure of the unit of power, it is desirable to adopt such a measure as will facilitate calculation, on which account I would suggest that the statute unit of power be specified as equivalent to 100,000 lbs. raised one foot high per minute; but, inasmuch as it would be a delusive misnomer to call this measure of power by the name of "horse-power," I would suggest that it be called "statute-power." An engine of 500 statute power would then be equivalent to what is called in the marine engine practice of the present day 500 horse-power, and it would have a legalised statute signification, whereby a contract for engines of 500 statute power would as expressly define the required contract capabilities of an engine as the statute ton weight, the statute gallon, the statute yard, and the statute acre, define the quantities to be delivered under those respective denominations. If the term horse-power be retained, it may be desirable to fix the statute unit as equivalent to 33,000 lbs. raised one foot high in one minute of time, this measure being generally recognised as the "indicated horse-power." Our commercial requirements are to define, measure, and register the *capabilities* of a ship for carrying weight and bulk, and the *capabilities* of the engines *available* for propelling the ship. It does not follow that the engines will be constantly worked up to the full amount of their capability, any more than that the ship will be always fully loaded.

8. As to whether the principle of the system of admeasurement by which ships are to be measured for their tonnage registration is to be prescribed by law, there can, I conceive, be no objection to this. It is, certainly, desirable that all the official admeasurements should be made on the same principle, and it is, of course, to be presumed that no system of measurement should be adopted that has not the sanction of competent scientific authority. Subject to this condition, attention may be directed to three different systems of admeasurements, namely: 1st. Taking vertical sections at equal distances apart, and thence determining the cubical contents by Sterling's rule, as adopted in the Act of 1854. 2nd. The system based on dividing the vessel by horizontal sections into parallel laminæ, calculating the areas of the sections by Sterling's rule or otherwise, and thence deducing what is known as the scale of displacements. 3rd. The system understood to have been originally applied to naval construction by Mr. James Peake, a shipwright officer in Her Majesty's service, based on taking vertical sections, wherever they can be most conveniently taken, or at such points as will best show any peculiar characteristics in the build of the ship, and thence deducing what is known

as the scale of vertical sections, and determining the cubical contents therefrom. Each of these systems has its advocates, and they are each of them applicable to determining the external measurements, by adding the thickness of the sides and bottom of the vessel at the respective points of admeasurement, or other special device suitable for the purpose required. Individually, I am of opinion that Mr. Peake's system, based on the scale of vertical sections, is the most easily applicable, for it does not require that the sections be equidistant, as is necessary by Sterling's rule; the most distinctly understood by persons competent to work by scale; the least liable to error, because, in a great measure, self-corrective; moreover, the schedule of measurements by Peake's system would not give the exact lines of the ship, as is the case with the system known as Sterling's rule. On the whole, therefore, in my opinion, Peake's system is the best for common use, in determining the cubical admeasurements, whereby the roomage and tonnage of a ship may be ascertained and registered; but whether one recognised system or another be adopted, is a mere matter of practical convenience and detail.

The foregoing remarks are respectfully submitted for the consideration of the Tonnage Committee, agreeably to their circular, 6th November, 1856

General Summary.

The foregoing matters touching the Merchant Shipping Act of 1854, have been thus generally gone into for the purpose of opening up those points of enquiry which bear especially on the limited duties assigned to this Committee by the British Association, namely, "To inquire into the present methods, and to frame more perfect rules for the measurement and registration of ships and of marine engine-power, in order that a correct and uniform principle of estimating the actual carrying capabilities and working power of steam-ships may be adopted in their future registration," and the conclusions at which I arrive on the points thus referred to this Committee are: That the Merchant Shipping Act of 1854 is an admirably conceived base of legislation, intended to concentrate all the objects for which legislation, in its protection of public interests, can be called upon to take cognizance of shipping affairs; that, so far as the inquiries assigned to this Committee are concerned, and which relate exclusively to Part 2 of the Act, there appears to be no absolute necessity for the cancelling any part of the existing clauses; but it is necessary that the provisions of the Act be extended to meet the following requirements, which are indispensable to the protection and promotion of public interests.

1. The Act of 1854 is defective, in so far that the prescribed registration, though called tonnage, takes no direct cognizance whatever of the tons weight of cargo that will either sink the ship, or that will immerse a ship down to any definite guage mark. The consequence is, that a ship chartered for the conveyance of merchandise may be filled with some descriptions of goods without being half loaded, or sunk with other descriptions of goods without being half filled. To remedy this deficiency it is necessary not only that the registration shall give the capacity of a ship for holding cargo, as is done by the present law, but also the capability for carrying weight of cargo as determined by the weight that will sink the ship down to a given guage mark, to be fixed upon the stem and stern or amidships of every ship.

2. The Act of 1854 is defective, in so far that it prescribes no regulations whereby the draught of water at which vessels actually put to sea may be officially inspected and recorded, with reference to a statute guage-mark, as above described, to be fixed upon every ship, such record to be received as evidence in the case of questions subsequently arising as to the condition in which ships put to sea; for the want of which record many of the provisions of the Act, evidently intended for the protection of life, become futile for want of proof as to the freeboard with which ships put to sea.

3. It is submitted that the official imposition of a guage mark to be fixed on the stem and stern of ships, or amidships, for the purposes above referred to, would, of itself, without any interference whatever on the part of government officers in the loading of ships, tend greatly to the prevention of overloading, whereby ships are rendered unmanageable, and life endangered. The provisions of the Act for the protection of life would then become operative, instead of being a dead letter as respects the overloading of ships.

4. The Act of 1854 is deficient in so far that it does not prescribe the measure of the unit by which the registered power of steam ships is to be determined, nor has any other Act of Parliament prescribed the unit of power by which engine power may be legally ascertained and designated, nor has engineering practice adopted any specific unit as the measure by which marine engine power is bought and sold. It is admitted that the working power of marine engines, as supplied to Government by the most eminent engineers under contract at the nearly uniform price of £50 per nominal horse-power, fluctuates upwards of 100 per cent. with reference to their nominal power, which regulates the cost. Under these circumstances the registration of engine power, without reference to any legalised statute unit, is an imposition on public credulity.

5. It is submitted that the legalisation of a statute unit of power, and the legislative obligation that the registered power or engine capabilities of steam-ships shall be ascertained and registered with reference to the said statute unit, will be no more of government interference with mercantile and engineering affairs, than is the imposition of the statute lineal foot, the statute gallon, or the statute ton weight. A legalised statute unit of power is a positive requirement of the age. It is not proposed that there shall be any obligation as to engines being worked up to their full power that they are capable of developing, any more than that ships shall not put to sea without being fully loaded.

6. It is further submitted that the deficiencies of the Act of 1854, in respect of the defective registration above referred to, vitiate the public statistics of the country so far as based on the registration of shipping; for, as shown in the foregoing pages, the ratio between the registered tonnage of a ship, and its capability for safely carrying weight of cargo, depends in great measure on the dimensions or proportions of length, breadth, and depth of the ship, so much so that (as shown) a ship of 2,000 tons register may be so proportioned as to have no displacement available for cargo without encroaching on the freeboard necessary to the safety of the ship, whilst another ship may be so proportioned externally and constructed internally as to safely carry the double of her registered tonnage, especially in the case of auxiliary powered steam-ships, which now threaten to supersede sailing ships altogether. Hence the mere registered tonnage of ships is not of itself a statistical criterion of the extent of trade, excepting in so far as respects the carrying power of similarly proportioned and similarly built vessels.

7. Registration under the Act of 1854 does not meet the requirements of commercial operations, as shown by shipping advertisements ignoring the legalised registration under the Act of 1854 referring to various designations of tonnage, such as gross tonnage, tons burden, tonnage O.M., tons (without designation), all which terms are exclusively made use of irrespective of the register ton, and not one of all these five terms for tonnage expresses or has any constant ratio whatever to the one thing needful, namely, the tons weight of cargo that a ship will carry with reference to any statute guage mark. Then, again, we see engines advertised as 100 H.P. nominal but 450 H.P. effective, and neither nomi-

nal H.P. nor effective H.P. have any statute signification or definite ratio to each other.

8. The Act of 1854 in respect of its registration deficiencies, is obstructive of the application of science to maritime engineering and architecture, as respects all investigations into the comparative dynamic performances of steam-ships as a means for practically determining the best type of form for the respective purposes or services for which ships may be required. The extent to which this exclusion of science for so important a part of naval engineering and architecture as that of developing the dynamic economy of different types of ships, is adverse to public interest, may be judged of from the fact, that on estimating the comparative dynamic capabilities of ships of given size, and required to steam at a given speed, but of different type of form, by any recognised law of scientific comparison, a vast difference of dynamic merit is found to be prevalent. The great majority of ships are found to be of a low order of dynamic merit, below what has been found to be practically realisable, so much so that the average of the generality of shipping requires probably 25 per cent. more power to attain a given speed than is required (*cœteris paribus*) by vessels of the superior type, which is occasionally produced; and when it is considered that the trade and navigation returns for 1856 show that the foreign import and export trade of Great Britain, as indicated by the registered tonnage of shipping, amounts to eighteen millions of tons per annum, whilst the home trade amounts to twenty-six millions, being a total of 44 millions of tons per annum, sea-borne trade (that is, if the weight tonnage be on the average equal to the register tonnage), and as the cost of all merchandise to the consumer, especially articles of necessity, such as corn and cotton, depend considerably on the cost of transport, it must be admitted that the registration of tonnage and engine power, though required only for the exclusive purpose of rendering science available for improving the dynamic performances of steamships, is, of itself, a consideration which demands the interference of the legislature as the guardian of public interests in all public affairs.

In conclusion, therefore, it is submitted that the defective condition of our shipping registration under the Act of 1854 is such as demands the consideration of parliament with a view to the extension of the Act to meet the following requirements:—

1. That a statute guage-mark shall be affixed on each side, amidships of every ship, for indicating the statute freeboard, the exact position of said mark to be determined by a rule based on the length, breadth, and depth of the ship taken in such proportions as the legislature shall determine, and corresponding marks shall be fixed on the stem and stern at such position in line with the midship mark as the approved waterline trim of the vessel shall indicate, and the dimensions of length, breadth, and depth, by which the position of the midship mark is determined shall be registered.

2. That in addition to the present registration of tonnage, based on internal measurement, the registration shall include the displacement of the vessel when light, ready to receive cargo equipped in all respects ready for sea, but not including coals and other consumable stores; also the displacement when immersed down to the statute guage-marks before referred to, and the total displacement measuring up to the deck; these displacements taken in cubic feet, to be rated at 35⅓ cubic feet to the ton weight, and the difference between the light displacement, and the statute guage-mark displacement, to constitute the registered weight tonnage of the ship.

3. That the draught at which ships actually put to sea shall be inspected and recorded with reference to the statute guage-mark on the stem and stern of the ship.

4. That a standard measure of power be determined and legalised as the statute unit, to which the registration of the power of steam-ships shall have reference; the registered power shall be that which engines and boilers shall, for the time being, be capable of continuously exerting, the same being ascertained by means of the indicator, as usual in the trial of steamers, and calculated by the statute unit.

STATISTICS OF WRECKS.

The following is a synopsis of the wrecks and casualties which have taken place during the past year on the coast and in the seas of the British Isles. The *Register*, which is accompanied by an engraved coloured chart, distinguishing the site of each casualty, was presented to Parliament by the Board of Trade:—

"In the year 1850 the first *Wreck Register* in this country was published. It was compiled, we believed, at the suggestion of Captain Washington, R.N., the present Hydrographer of the Admiralty. The startling facts which the *Register* has in each successive year since disclosed have awakened general attention, have several times being discussed in both Houses of Parliament, and have resulted in the establishment on our coast of a system of lifeboats for the preservation of the lives of unfortunate shipwrecked individuals that has never had a parallel in this or any other country. In this philanthropic work, in which the Royal National Lifeboat Institution has taken so prominent a part, much remains still to be done; and, if we expound correctly the views of the committee of management of that institution, we believe that it is their fixed determination, if aided by the support of the public, to leave no exposed point on our dangerous coast unprovided with an efficient lifeboat establishment.

"The following list gives some details of the work of destruction during the past five years:—

Wreck and Casualties in	Wrecks.	Collisions.	Total.	Total Lives lost.
1852	958	57	1,015	820
1853	759	73	832	989
1854	893	94	987	1,549
1855	894	247	1,141	469
1856	837	316	1,153	521
Total	4,341	787	5,128	4,348

"Who can contemplate these lamentable details without seeing the great necessity for continued exertions and precautionary measures in respect to the preservation of life and property? The same, too, must be pursued with untiring energy until the average loss of life and property is reduced to the *minimum* attainable by human skill.

The number of casualties in each month of 1856 are thus given in the *Register* for that year:—

	Vessels.		Vessels.
January	149	August	51
February	154	September	98
March	96	October	99
April	74	November	129
May	57	December	166
June	32		
July	48	Total	1,153

Representing 229,936 tons, and employing 10,014 hands, of whom 521 perished,

"These disasters are again classified:—

Sailing ships over sea	546	Colliers	139
Coasting ships not colliers	432	Steamships	34

"These vessels are again classified so as to distinguish their cargoes, that is:—

In ballast, not colliers...	108
Coal laden	314
Colliers in ballast	79
Cotton........................	12
Fishing smacks...........	10
Fish or oil	19
Grain and provisions...	115
General cargo.............	139
Iron and other ores ...	83
Manure and kelp	26
Passengers	11
Potatoes or fruit	15
Salt	46
Sugar, coffee, spices, tea, molasses	19
Stone, slate, lime, or bricks	40
Timber or bark	86
Various	31

"We arrive at the conclusion from these facts that our coasting trade, and our coal trade in particular, is the most dangerous and yields one-third of the whole losses or collisions. Indeed, it is useless to disguise the fact that some of our coasting vessels are a disgrace to us as a nation. Only a few months ago a small schooner from Sandwich, while riding off Bridlington, was so rotten that her anchor pulled out her bows, causing her of course to sink, and her unfortunate crew of four hands to perish. And again, on the 8th of May last, a small schooner, known to be unseaworthy (as we are informed), went to pieces off Aberdovey, on the coast of Wales, before there was time for any aid to reach the crew. May we not presume that rigid inquiry would discover many other similar cases among the numerous details of the *Register*, even in addition to the large number stated to have been abandoned or to have foundered from unseaworthiness? Surely a remedy might be found for such a disgraceful state of things.

"An analysis of the tonnage of the wrecks on our shores during the past year further tends to prove our statement. It is as follows:—

Vessels under 50 tons	145
51 and under 100 tons................................	338
101 and under 300 tons	472
301 and under 600 tons	137
601 and under 900 tons	34
901 and under 1,200 tons	15
1,200 and upwards	12

"The exact site of each disaster is given in the *Register;* and to prevent the possibility of error on this point, the wreck chart, which accompanies it, clearly and distinctly points out the locality of the wreck. What a tale of woe and misery this death chart brings to light; who can think of it without feeling a desire, by every means in his power, to lessen the causes of those black dots on it? The following is the summary:—

	Vessels.
East Coast—Dungeness to Pentland Frith	506
West Coast—Land's-end to Greenock	307
South Coast—Land's-end to Dungeness	119
Irish Coast..	155
Scilly Islands	12
Lundy Island	11
Isle of Man	5
Northern Isles, Orkney, &c.	38

"We believe that after this additional evidence a proposition will be submitted to parliament in the early part of next session to build a harbour of refuge on the north-east coast of Scotland, another on the north-east coast of England, and a third on the west coast of England.

"The return distinguishes the force of the wind at the time of each disaster, which is instructive so far as it proves that it is not the storm or the hurricane that destroys the largest number of vessels, and that more danger is to be dreaded from the carelessness, neglect, or incompetence of man than from the act of God.

"The following table gives a list of the wrecks and casualties, excluding collisions, which have involved total loss, distinguishing the cause of loss:—Stress of weather, 148; abandoned from unseaworthiness, 17; foundered from unseaworthiness, 37; want of lights or buoys on coasts or shoals, 10; mistaking lights or bearings, 10; fog or current, 38; defective compasses, 5; defective charts, 3; error in course of reckoning, 6; error in judgment, 12; ignorance of coast, 3; errors of pilots, 7; want of pilot, 3; neglect of the lead, 21; want of caution, 11; intemperance, 2; general negligence, 9; missing stays, 10; striking on sunken wrecks, 1; burnt, 4; capsized or sunk, 4; cause unknown, 7; total, 368.

"Thus we find that no less than 220 ships were totally lost or stranded in 1856 from errors, unseamanship, or drunkenness, or other preventible causes, in addition to those from stress of weather. The number of lives lost from these disasters is not given; but the widows and the orphans of some of these unfortunate crews in our seaports are too numerous to elude our observation. If one out of every nine ships is lost from inefficiency, whose duty should it be to see that crews are fully equal to their duties? We have often contended that every English ship before leaving port should be submitted to inspection, in order that it might be certified that the ship is fully manned, and that means both simple and efficacious exist on board for the safety of the crew and passengers.

"When considering the above details, is it not a matter for serious reflection that there should have been

	Vessels.
Abandoned from unseaworthiness..................	17
Foundered from unseaworthiness	37

"Those 54 vessels lost from unseaworthiness form 5 per cent. of the whole casualities, or 17¼ per cent. of total losses. Whole crews are frequently sent to prison in this enlightened country for refusing to go to sea in unseaworthy ships; and now it is made clear that, out of 368 vessels totally lost in 1856, no less than 54 are officially affirmed on inquiry to be unseaworthy. But this is not the whole truth; we must add the vessels improperly found to that list, and there we see a little more of the mischief:—

	Vessels.
Totally lost or stranded from defective compasses..	14
Ditto, from defective charts	5
Ditto, from improper stowage of anchor	1
Ditto, from combustion of steam coal under hatches, and want of proper ventilators	10
Ditto, through leakage	87
	117

"A ship will leak at sea from straining, but the large number of 87 vessels on our coast seems to be too great a per-centage for such a casualty. A ship sent to sea with defective compasses or charts, and lost from that cause, ought to be classed under the head of unseaworthy.

"If all vessels were inspected by competent authorities before sailing, we suspect that the condemnation of existing vessels and equipment would be wholesale. We judge so from various reasons. In 1850 the British tonnage was 4,232,962 tons; we learn that the ships and steamers broken up in that year were 129, registering 5,766 tons. The vessels wrecked in 1850 were 692, of 127,188 tons. But the new vessels registered were 689, of 133,695 tons, to which might be added the vessels built and sold for foreigners. The deaths from old age and infirmities were only 129 out of 33,672. In December, 1855, the number of ships registered in the United Kingdom from the Board of Trade return was 25,115, of 4,286,908 tons, and the ships lost or damaged during the year ending the 31st of December, 1856, were 884, of 151,470 tons, being 3·5 per cent. of loss. Foreign vessels are here excluded, so that we are still left in the dark as to the vessels broken up relatively to aggregate tonnage and losses. From Lloyd's register of wrecks we gather that 1,959 vessels were lost in 1856; this includes ships to distant ports not given in the Government return. Old vessels are made to do duty till they founder at sea. When a vessel is fit for nothing else she is put in the timber trade, and the fearful accounts we read of water-logged ships follow as a necessary sequel.

"We thus, from the preceding considerations of defined causes, can come to no other rational conclusion than that more ships are wrecked from oversight, ignorance, neglect, and spurious economy than from the dangers of the sea. Did we require more convincing demonstration of this attestation, we have but to refer to the table which gives the force of the wind, and, as we have before remarked, this is a highly instructive part of the paper before us—thus:—

	Casualties.
Dead calm	19
Light air and slight steerage way	22
Light breeze of one to two knots	58
Gentle breeze of three to four knots	49
Moderate breeze of five to six knots	98
Fresh breeze, with royals	154
Strong breeze; single reef and topgallant sails	140
Moderate gale; double reefs and jib	101
Fresh gale; triple reefs	60
Strong gale; close reefs and courses	184
Whole gale; close reefed maintopsail and reefed foresail	147
Storm; under storm staysail	77
Hurricane; bare poles	44
Total	1,153

"This proves our statement; for, out of 1,153 ships, only 268 were lost in a whole gale, storm, or hurricane, and only 121 by the conjoint agency of the two latter.

"We now approach the most lamentable feature in these returns. Of the number of lives more or less imperilled, we find them set down as 2,764, of whom 521 were drowned. Those saved by the mercy of God and the help of man were thus rescued:—

	Persons.
By lifeboats of the Royal National Lifeboat Institution, and local bodies	362
By luggers, Coastguard boats, small craft, and ships' own boats	1,184
By ships and steamvessels	407
From shore, by ropes, rockets, mortar apparatus, &c.	262
Individual exertion of a meritorious character	28

"The facts clearly illustrate that great exertions are constantly being made by our lifeboat crews, boatmen, and fishermen, on the coast, to save life from shipwreck, facts which should call forth the acknowledgment of the community at large, as showing most satisfactorily what can be accomplished in this good work by sustained and well-directed efforts. And surely an institution like that of the National Lifeboat Society, in addition to having granted rewards for rescuing 473 persons from shipwrecks, the lifeboats of which have been the means, during the past 12 months, of snatching 129 of our fellow-creatures from a watery grave, has only to make its claims extensively known to be fully appreciated and liberally responded to by the affluent and humane throughout the land.

"We thus appeal on behalf of the cause of humanity, but we ought not to be required to appeal to shipowners and underwriters to see that their ships are properly manned and furnished; for we believe that it is their best interest which is consulted in attending to that manifest duty."

GUIDEWAY STEAM AGRICULTURE.

Some experiments in steam cultivation have recently been tried on a small scale by Mr. P. A. Halkett, on some land occupied by him at West-hill Farm, Wandsworth, upon a system invented by himself. It may be premised that till this plan is tried on a more extensive scale, the important question of its merits, in a commercial point of view, must remain unsolved. In describing his system, Mr. Halkett says:—

"It consists in laying down, at wide intervals, permanent guideways or rails, by which means a platform, carrying the motive power, is supported and guided, and to the under-side of which are attached the various implements to be used. The whole of the weight being carried, without bearing in any way on the land, culture can be forwarded in any weather and state of the ground without injury, even on the heaviest clay soil, leaving it in a state of lightness impossible to arrive at where the weight of men, implements, horses, or tractive power is constantly consolidating or poaching it, added to which, by consecutive ploughings in the same furrow, it can be cultivated to a depth hitherto unattainable except by the costly operation of deep spade trenching, while fresh soil to an exact quantity required may be brought up and intermixed with the top soil.

"The surface of the soil may be pressed by rollers attached to, and drawn by, the steam platform.

"The weight also of other things besides that of the engines and implements will be carried with great advantage upon the rails; all the crops will be carried off and the manure carried on to the land; and, when the number of tons weight is considered which these constitute upon many farms or gardens, varying from 20 to 100 tons per acre per annum, and the extent of land that there is for their cartage, and when it is remembered that a horse draws *twenty* times as much on a railroad as it does on a ploughed field, while in addition steam power performs work much cheaper than animal power, it will be seen to what advantage, in comparison with others, I can carry great weights. In fact varying soils may be carried from one part of a farm to another for intermixture with each other, or, if a farm abuts on a railway, they may be brought from a distance, and deposited on the spot required, without in their transit once coming off rails. An improvement to the land may be rendered practicable by this means, where now it is impracticable, and landed estates may often be increased in *permanent* value; also farms thus situated may send any of their produce to towns, without the crops having been off a rail from the time of leaving the soil, and, in return, manure may come back in the trucks.

"The quantity that could be ploughed per day with power suitable to a farm of 1000 acres would be 25 acres, and two men would be all that are required to conduct the operation. This calculation, it must be understood, is based upon the work which I have repeatedly done. And, moreover, when the time presses, by a change of men, double this amount, namely 50 acres, may be done in the twenty-four hours, because the operation can be carried on by night as well as by day. Conceive the great advantage of being able thus to break the land up in favourable weather, or for a rapid autumn cultivation. This great economy of time, I may add, is also available for reaping and carrying harvest.

"The rails forming a guide to the implements insure that every operation shall follow in the same line or parallel to it. Thus I have drilled by the steam machinery rows of plants, and when they have come up, I have hoed them repeatedly by the same steam machine with the greatest perfection, and at all stages of their growth. In fact, I have placed the blades of the hoes on each side of the rows, so near to them as to cut within half an inch distance from the stalks without doing any injury to a single plant as the machine hoed them. I may mention that I have frequently placed upright in the ground two small sticks (two pencils) at a distance from each other of *one inch*, and having fixed a small stirrer or tine, propelled it at the full speed of the engine, cutting the ground between the sticks without, on any one occasion, disturbing either of them.

"The importance of this precision of operation will be appreciated by those who are aware of the large price paid by our best cultivators and market-gardeners for hoeing by hand labour, in consequence of the imperfection of horse-hoeing, while the impossibility of hoeing by horses when the crops are close or high is acknowledged.

"These are some of the advantages of the system, irrespective of the cost at which the whole is carried on, which, though it were greater than that of common farming, yet, by the quality of the work, would pay over and over again in a large increase of produce, a point easily proved by referring to the gross amount taken from a certain acreage of market garden land. In this I am not alluding to crops of limited cultivation, but to such as are for the food of cattle, or of a bulk fit for transport.

"The whole cost of the system may be divided into—1. Annual rent for the rails, which may safely be put down as not exceeding £2 per acre per annum for a farm of 700 or 1000 acres, or £4 for market garden land near London. 2. The interest and wear and tear of the engines and implements, which may be set off against the same for horses and horse implements. And 3. The cost of working the same, which will be found subjoined. The first of these costs above named, the £2 per acre per annum, is not large when it is found how small it makes the cost of the last named. In fact the system in its economy is analogous to that of railways and cotton factories, where, though the first cost is large, yet are they the cheapest possible means of accomplishing the ends in view; these advantages are gained by the same means that steam has effected the great results it has in every way in which it has been employed—1st, By using engines of large power; and 2nd, by adapting them to all the operations to be performed, to the exclusion of all other motive power.

"Cost of the Operations for a Farm of 1000 Acres.

"Ploughing 5in. by 10in. furrows, 1s. 7d. per acre.

"Deep cultivation, to the depth of 25in. (explained below), 12s. per acre.

"Scarifying, grubbing, &c., 8d. per acre.

"Harrowing, clod crushing, rolling, 5d. per acre.

"Hoeing (150 acres could be done per day), 3d. per acre.

"Drilling or dibbling seed, 5d. per acre.

"Reaping (cutting and delivering) at 60 acres per day, 8d. per acre.

"Underground watering crops at the rate of 3000 gallons per acre, at 60 acres per day or night, or double this quantity if done by night and day, 1s. per acre.

"Surface watering (with hoes following), 1s. 2d. per acre.

"Carriage of manures on to and distributed over land, and of crops carried off; also carriage of marl, clay, sand, &c., ½d. per ton per mile.

"The amount that can be carted at a time, for either water or manures, &c., 70 tons.

"The operation of 'underground watering' consists in supplying to the roots of the crops, while at the same time the ground is stirred and hoed, water (or liquid manure), by drawing hollow bars between the rows of the plants, at the bottom of which the liquid escapes at any desired depth. By this means the fluid is economised on account of the evaporation from the surface being prevented: it does not cake the soil, which agriculturists object to as the result of the usual practice of watering; and it does not draw the roots to the surface in search of the moisture, afterwards to be injured by the parching of the ground. The operation has the warm approval of all the market gardeners who have seen it.

"I have now to explain the operation of deep cultivation which I have done. I have first drawn six ploughs, cutting six furrows simultaneously, to a depth of five inches; passed over again to a further depth of five inches with the ploughs; and at 15 inches below, in the subsoil of a hard yellow clay, drawn an anchor with a palm of nine inches width through the subsoil; thus ploughing and breaking up the ground to a depth of twenty-five inches. This is a depth of cultivation sometimes done by market gardeners by trenching, and would cost £10 or £12 per acre."

The following Estimates, extracted from a letter to the Inventor, are by Mr. Braithwaite of 18, Great George-street, Westminster.

Referring to your figures, and having carefully gone through the whole calculations and detail, I not only can add my testimony to the results of your own investigation and conclusion, but I am of opinion your system can be carried out at a less outlay.

Assuming the Permanent Way upon a farm of 1,000 acres to be set out at widths of 50 feet, which would involve a platform of at least the same length to carry the engines and to which the various implements would be attached, I consider the cost per acre, including the traverse rails on head lands road, would amount to £25 per acre, plus 10 per cent. contingencies, £27 10s.

The cost of the platform, including the engines, boilers, the auxiliary trucks, together with the agricultural implements, would amount to £2,888.

The cost of wear and tear upon railway and machinery, including agricultural implements, may safely be estimated at 30s. per acre per annum.

The cost of cultivation may safely be taken at your figures, except reaping and carriage of manure, which I should increase.

	s.	d.	
Ploughing	1	7	per acre.
Deep cultivation	12	0	,,
Sacrifying, &c.	0	8	,,
Harrowing, rolling	0	5	,,
Hoeing	0	3	,,
Reaping, cutting and delivering	0	10	,,
Underground watering	1	0	,,
Surface watering	1	2	,,
Carriage of manure on to land, and distribution	0	1	per ton per mile.

MINERAL STATISTICS OF THE UNITED KINGDOM.

The mineral statistics for 1856 having been prepared by Professor Hunt, F.R.S., Keeper of the Mining Records, have been recently published in a detailed form by order of the Lords Commissioners of the Treasury. In the introduction to this work Professor Hunt states that these statistics embrace every important branch of our mineral industries, and he then gives the following general view of their progress and present condition, showing their relative values in 1856 and the two preceding years:—

Tin.—In 1854 the Mines of Devon and Cornwall produced of Tin Ore, commonly called *Black Tin*	8,747	Tons.
In 1855	8,947	,,
In 1856	9,350	,,

Thus we find an increased production of 603 tons of tin ore in 1856 over that of 1854.

In 1854	at the average price per ton of		£64	the Ore produced	£559,808
In 1855	do.	do.	68	do.	608,396
In 1856	do.	do.	71	do.	663,850

The mean average prices of metallic tin have within the same periods varied as follows:—

	£	s.
In 1854	115	10
In 1855	120	0
In 1856	134	13

From the high price of this metal there has naturally been considerable activity in the tin-mining districts; many mines which are, under those circumstances, now worked at a profit, would be unable to meet their heavy expenses should any considerable reduction take place; but the demand for this useful metal is at present too great to render this probable.

Our importations of tin have also greatly increased.

In 1854, of tin in Blocks, Ingots, &c., we imported			2,251 Tons.
In 1855	do.	do.	1,612 ,,
In 1856	do.	do.	3,464 ,,
		and of Regulus ...	749 ,,

Copper.—The quantities of metallic copper produced from the mines of the United Kingdom in the last three years were as follows :—

	1854.	1855.	1856.
	Tons.	Tons.	Tons.
Cornwall and Devonshire...	11,979	12,578	13,533
Sold at Swansea...............	1,245	1,276	1,245
Purchased by Private Contract.........................	6,493	7,440	9,479
Total.........	19,717	21,294	24,257

The fine copper in 1856 being the produce of 278,792 tons of copper ore obtained from the mines of Great Britain and Ireland, the money value of the ore being £1,744,516.

This exhibits, in 1856, an increase in our production of fine copper of 2,963 tons over that produced in 1855, and of 4,540 tons more than the quantity yielded in 1854.

In the same periods, the proportion of copper produced at Swansea from the foreign and colonial ores, sold at the public ticketings at that port have been respectively—

1854	3,455 Tons.
1855	4,650 ,,
1856	4,837 ,,

The money value of the copper produced at our British Smelting Works being, in

1854	£2,331,804
1855	2,867,207
1856	2,846,803

The mean average market price of the several varieties of metallic copper being, in 1855, £140 5s., and in 1856, £125.

Lead and Silver.—More than four hundred lead mines sold lead ore during the year. The produce of the mines of the United Kingdom in 1856 and the two preceding years was as follows :—

1854, Metallic Lead ...		64,005 Tons.
1855,	do. ...	73,091 ,,
1856,	do. ...	73,129 ,,

It will be seen that there has been a uniform rate in the production of lead from the British mines, but at the same time our importations of this metal have been larger than they were in 1855, when we imported 7,246 tons of lead; the quantity received in 1856 being 10,254 tons. This is less, however, than the imports of 1853 and 1854, which were, respectively, 17,564 tons, and 11,858 tons.

The mean average prices per ton of lead ore, as deduced from the public sales, were—

	£	s.	d.
In 1855	14	4	6
In 1856	14	8	0

the money value of the lead ore sold in 1855 being £1,311,971, that of 1856, or 101,997 tons, being £1,431,509. The mean average price of pig lead in 1855 was £23 3s. per ton, and in 1856 it was £24 per ton. The actual market value of the lead smelted being, in 1855, £1,692,055, and in 1856, £1,755,096, to which must be added the silver extracted; the quantities having been in the last three years as follows :—

	Ozs.		£
1854	562,659	Value	140,666
1855	561,906	,,	140,476
1856	614,188	,,	153,547

In 1855 we imported 7,222 tons of silver ore, producing 2,112,246 ounces of silver; and in 1856, 6,636 tons, which gave 1,748,735 ounces of that metal.

Zinc.—From the small demand for English zinc ores, comparatively limited quantities were raised for many years. The sulphides of zinc have become more valuable, and hence they have been sought for and sold in larger quantities than formerly,—9,003 tons being sold in 1856, the money value of which was £27,445. The importations of zinc have declined. Of Spelter, we received in 1853, 23,419 tons; in 1854, 19,583 tons; in 1855, 17,845 tons; and in 1856, 18,213 tons. During last year we exported 3,153 tons of British zinc, while in 1855 we only sent out of the country 2,516 tons.

I am enabled to refer with satisfaction to the present returns of iron pyrites, arsenic, &c., which are far more exact than any which have hitherto been published.

Iron.—The enormous increase which has taken place in our iron manufacture will be seen upon reference to the detailed statements. The returns of iron ore are far more complete than those which have been given in any former publication, and they may now be regarded as a very close approximation to the real produce of all the iron-mining districts of the United Kingdom.

Those returns show that 10,483,309 tons of iron ore have been raised, and that 3,636,377 tons of pig iron have been produced. Iron ores have sold, according to their respective qualities, at the mines, for prices varying from 5s. to 15s. per ton. The mean average price of iron ore, computed from the sales of all the districts, has been 11s. per ton. This will give £5,695,815 as the value of the iron ore produced in 1856 in Great Britain. The total produce of pig iron, at the mean average market price, or £4 per ton, will give a money value equal to £14,545,508.

Coals.—The large development of our iron and other manufactures has naturally led to a considerable increase in the quantity of coals raised. Notwitstanding the great excess of the return obtained in 1854 over any previous computation, I find it exceeding in 1856 even that surprising quantity; the coal produce of the last year and the two previous years being as follows :—

1854.....................	64,661,401 tons.
1855.....................	64,453,070 ,,
1856.....................	66,645,450 ,,

This shows an increase in 1856 of 2,192,380 tons over the coal produce of the previous year, and, at the average price of coals at the pit's mouth, gives a money value equal to £16,663,862. There has been an increase of nearly one million of tons in our exports to foreign countries, and the quantity of coals sent coastways and by railway is larger than in any former year.

Among the smaller articles of mineral produce, salt, iron pyrites, arsenic, barytes, and fluor spar show a much higher value than those substances were generally thought to possess.

Although the returns of building stones have been considerably increased, yet the detailed lists are far from being perfect. Enough, however, has been done to enable, by careful computation, a tolerably close estimate of the value of these important productions, to be made. The difficulty of obtaining returns of the quantities of clay manufactured into bricks, tiles, &c., is so great, that, with the exception of the finer varieties employed for porcelain and fine earthenware, it appears, at present, almost impossible to arrive at any approximation to the real value of this raw material.

The value of the mineral productions of the United Kingdom has been estimated, in the following table, upon the principle of taking the mean average price of the substances at the mine, colliery, or quarry, *before any charges for carriage have been made, or cost has been added in any way for manufacture.*

VALUE OF THE MINERAL PRODUCE OF THE UNITED KINGDOM IN 1856.

		£
Tin ore		663,850
Copper ore (*the produce of all the sales, excluding foreign ores, but including private contract purchases*)		2,343,960
Lead ore (as sold, containing silver.)		1,431,509
Zinc ore		27,455
Iron pyrites		46,066
Arsenic *Sold in Cornwall*	£1,011	
Arsenic *Other sales*	900	
		1,911
Nickle and uranium		527
Iron ore		5,695,815
Coals		16,663,862
Salt		553,993
Barytes and other minerals		10,000
Porcelain and fine clays		120,896
		27,559,844
Building stone (*estimated on the basis of the returns and prices given.*)		3,042,478
Total		30,602,322

The market values of the metals, as obtained from the furnace, have amounted to the following sums:—

	£
Tin	808,241
Copper	2,846,803
Lead	1,755,096
Silver	153,547
Zinc	225,075
Pig iron	14,545,508
Other metals	100,000
	20,434,270
Other mineral products (*exclusive of building stones*)	17,348,751
Total	37,783,021

IRON, COPPER, AND STEEL.

The *Moniteur* has recently published an imperial decree, admitting into France, duty free, cast iron, bar iron, sheet iron, angle iron, bar steel, and rolled copper or alloy of copper, imported from foreign countries as raw material, and destined for re-exportation after having been converted by French manufacturers into iron ships or iron boats, machinery or engines to be used either on railways or in any branch of manufacture for which those metals are required. The advantages of this permission are only to be enjoyed by those ironmasters, manufacturers, or builders, who can exhibit evidence of their having actually received foreign orders for the articles into which the metal is to be manufactured. Certain formalities are prescribed in order to obtain this exemption from duty. Bar iron, to be entitled to this privilege, must be at least 458 millimetres in the width, multiplied by the thickness, if flat, or 22 millimetres thick each way, if it be squared with four sides; 15 millimetres in diameter, if cylindrical. The importers must undertake to re-export these materials, in their manufactured form, within six months. Old iron also, from foreign steam-vessels undergoing repairs at French ports, may be admitted duty free on these conditions.

SURFACE DRAINAGE OF THE METROPOLIS.

The Registrar General, in his report for the week ending Saturday the 24th inst., says:—

"On Thursday the wind blew from the north and north-east, while heavy rain fell continuously during the whole day, making the total fall at 9 p.m. 2·57 in. The average annual fall of rain in London during the 17 years, 1840-56, was 24 in.; consequently more than a tenth part of the average fall of rain in 365 days fell on Thursday last. The fall of rain on an acre was 58,140 gallons, or rather more by weight than 259 tons. As the area of the London districts is 78,029 acres, the fall of rain on the whole surface, if the average rainfall be assumed to be represented by the Greenwich observation, exceeded 20,000,000 tons, or 84,000,000 hogsheads. Now the question of the drainage of London is under consideration these facts will, no doubt attract the attention of engineers."

SOUTH KENSINGTON MUSEUM.

During the week ending 24th October, 1857, the visitors have been as follows:—On Monday, Tuesday, and Saturday (free days), 2,815; on Monday and Tuesday (free evenings), 4,761. On the three students' days (admission to the public 6d.), 325. One students' evening, Wednesday, 149. Total, 8,050.

Home Correspondence.

THE ELECTRIC LIGHT.

SIR,—I shall be obliged if any of your readers can inform me whether, among the several plans and modifications suggested in the apparatus recently introduced in England and France for perfecting the Electric Light, any of them are likely to render it commercially economic and permanent, so as to fit it for domestic and general use. This seems to me to be a subject of immense importance in connection with the lighthouse system. I am, &c., G. F.

ROAD-SIDE TREES.

SIR,—Your Journal of the 16th of October contains the excellent suggestion that parishes, now that the horse-chesnut has become an article of trade, might derive considerable profits by cultivating the tree along the sides of the roads, &c. It has, all along, struck me, that parishes might procure a considerable income from such a regular system of plantation of fruit-bearing or other useful trees. In many parts of Germany, the communes or villages derive large profits from this kind of property, planted along the sides of the high roads. The crop of each fruit-tree is sold by public auction, in the open road, at the end of each gathering season, yielding, on an average, four florins, or about 6s. 8d., per tree, the purchaser being at the expense of gathering the fruit. This source of income is nearly sufficient to defray the ordinary local expenses of each commune, including the schoolmaster's salary.

Might not such a system of plantation be also introduced by the numerous railway companies in this country, with great advantage to themselves and the community at large, along the sides and sloping terraces of the railroads through the length and breadth of the land? Millions of fruit-trees would yield an additional quantity of wholesome food, besides that excellent unintoxicating domestic beverage, cider, and would thus add, in a marked degree, to the comfort and well-being of the people.

Let there be but the will, and the way will soon be found.

I am, &c.,
A. BACH.

London, 26th October, 1857.

Proceedings of Institutions.

Chichester.—On Thursday evening, the 8th inst., the members of the Literary Society and Mechanics' Institute held their thirty-second anniversary meeting in the lecture-room, at Southgate, when there was more than an average attendance. Wm. Gruggen, Esq., vice-president, having been called to the chair, Mr. Gauntlett, the secretary, read the report, in which the members were congratulated on the progressive increase and prosperity of the Institution. The number of members during the past year has increased from 468 to 514, and the financial statement showed a balance in favour of the society of £19 8s. 3d. It was announced, however, that there were liabilities, including the expense of printing a new catalogue of the library, which would nearly exhaust the sum of money in hand. The museum had been enriched by numerous and valuable specimens, and objects of curiosity, through the liberality of its friends, and the greater portion of its contents had been re-arranged by Mr. Hills, the curator. A course of lectures has been prepared for the ensuing season, the first of which was delivered before a crowded audience, by the Venerable Archdeacon Garbett, on "Wellington." In the library department, considerable additions have been made, whilst the whole of the books have been recently inspected, and several superfluous and imperfect copies withdrawn, and subsequently sold. A large number of books are in constant circulation, and among those in most frequent request are works of fiction and light literature, next to which may be reckoned biographical and historical works. The report proceeded to acknowledge the receipt of four valuable busts, with appropriate brackets, which were presented by one of the members, Mr. G. Purchase, in recognition of the benefits he had derived from the Institution. It is to be regretted that the attempt to establish educational classes in connection with this Institution has not been successful. These were commenced two years ago, under circumstances which appeared to augur well for their success; but, notwithstanding the zeal and ability of the conductors, there was an almost total absence of response on the part of those for whose benefit they were specially designed, and consequently, with one or two exceptions, they have now ceased to exist. The report concluded with an announcement that, in consequence of an appeal from the members of the "Working Men's Reading Room," a committee had been appointed to inquire into the practicability of establishing a reading and news-room in connection with the Institution, but to be supported by funds raised independently for that purpose. The great obstacle, however, in the way of such a scheme is stated to be the making the Institution liable for the payment of local rates and taxes, and the uncertainty of the law affecting this question of rating is said to be a frequent source of complaint. On the appointment of officers to serve during the ensuing year, his Grace the Duke of Richmond was re-elected president; the Rev. J. Fullagar, Dr. Tyacke, and Messrs. B. Adams and W. Gruggen, vice-presidents; H. W. Freeland, Esq., representative to the Society of Arts; Mr. G. Paull, treasurer; Mr. T. Pescod, curator of apparatus; Mr. J. Gauntlett, secretary; Messrs. Barnard and Duddin, auditors; and eighteen committee-men to form the Board of management. Votes of thanks were then given to the officers of the society for their services during the past year; to the amateur lecturers and conductors of classes, for their gratuitous services; to the donors to the museum and library; and to the secretary, Mr. Gauntlett, for his zeal and ability in the discharge of the duties of his office, which, though very onerous, are rendered gratuitously. After the transaction of the usual business, several topics were brought under the notice of the meeting by the members, affecting the interests and well-being of the Society. A vote of thanks to the chairman closed the proceedings.

Glasgow.—The thirth-fourth annual report of the Mechanics' Institution, states that the funds have been adequate to meet the demands made upon it. The trustees of the late John Ferguson, Esq., of Cairnbrock, have allocated a grant of £200 to the Institution, from the bequest of £50,000, left by the deceased for charitable, educational, and benevolent purposes. During the last ten years, the following subjects have been brought forward in the Institution:—Lectures and instructions have been given on Chemistry; Natural or Mechanical Philosophy; Anatomy and Physiology; History; Grammar and Composition; the Theory and Practice of Music; Physical Geography; Architectural Drawing; Mechanical Drawing; Drawing, Painting, and Perspective; Mathematics, including the higher branches of Arithmetic; Civil Engineering and Surveying; Botany; Rhetoric and Elocution. It is with deep regret that the directors refer to the sudden death of Dr. John MacEwan, late lecturer on anatomy and physiology, which took place early in February last. That event unhappily brought the course to a close, as no lecturer could be expected to take it up at that period. The students met shortly after his death, and passed the highest encomiums upon the deceased, and expressed their sorrow for the loss they felt through his death. Mr. William Swanston, who has been curator and collector of subscriptions to the Institution for the last twenty-eight years, has resigned his situation, from a desire to enjoy his riper years in retirement; and Mr. Alexander Paton, 130, North John-street, Glasgow, has been appointed his successor. The directors observe that Mr. Swanston has retired respected and esteemed by all, and his long and faithful services have greatly conduced to the prosperity and usefulness of the Institution. The following are the number of lecture tickets sold during the last session:—"Chemistry," Mr. William Wallace, 76; "Natural Philosophy," Mr. Thomas Johnston, 73; "Anatomy and Physiology," Dr. John M'Ewan 17; "Theory and Practice of Music," Mr. Samuel Barr, 73; "Elocution," Mr. John Macpherson, 42; "Botany," Mr. Roger Hennedy, 44; "Mechanical Drawing," Mr. Robert Harvey, 142; "Drawing, Painting, and Perspective," Mr. A. D. Robertson, 140; "Arithmetic and Mathematics," Mr. H. M. Ashcroft, 140. Ten free tickets were issued to apprentices of deserving character, who were unable to purchase tickets for themselves. At the commencement of the session, a number of the more advanced students in the mathematical class, came forward requesting to be formed into a senior class—distinct from the other classes—in order that they might have an opportunity of studying more thoroughly those subjects with which they were already acquainted, and of acquiring a knowledge of some of the higher branches of mathematical science. This request was complied with; and, although they have met only one night each week, they have made considerable progress. The mutual instruction class is an association, composed entirely of members of the various classes in the Institution, and is becoming more and more an object of interest. The number of its members at present amounts to twenty, and the average in attendance is thirteen. Thirty-three essays, and seven questions for discussion, are set down in the syllabus of the association. The meetings take place once a week. Mr. Craig and assistants conduct morning, day, and evening classes, in the Institution rooms, for instruction in reading, writing, arithmetic, book-keeping, geography, history, grammar and logic. These classes continue to increase. The day pupils during the past year, amounted, in the public classes, to 170, in the private, to 16; the evening pupils, in the grammar and logic class, to 120; in the arithmetic and book-keeping class, to 151. The class for phonography, conducted by Mr. Stevenson, amounted to 86; and French classes, recently commenced under Mr. Morton, have opened with a favourable prospect. The library continues to increase, and now numbers more than 6,100 volumes. The works of which it is comprised are of the most useful and instructive kind in general literature, science, and art; and the public are admitted to its use at a very moderate charge. The museum is open for inspection to members of the Institution and their friends. The annual soirée of the members and friends of the Institution was held in the Hall, on Thursday evening, the 19th March last, Councillor Couper, President, in the chair. During the evening the president gave a brief outline of the progress of the several classes. Bailie Taylor, Councillor M'Adam, the lecturers, teachers, and other friends of the Institution, delivered addresses on various subjects. Mr. Barr, at intervals, enlivened the proceedings by singing several pieces of music, which he accompanied with the organ. The annual meeting took place in the Hall, on Tuesday evening, 26th May, at eight o'clock. The several drawings of the students in the mechanical, and the drawing, painting, and perspective classes, were exhibited on the walls. In the absence of the Hon. Andrew Orr, Lord Provost, who was detained in London on public business, Sheriff Bell was called to the chair. His lordship was supported by Bailie Clouston, Councillor MacAdam, Councillor Couper, President of the Institution, James Holmes, Esq., Vice-president, and several of the directors, lecturers, and teachers. After the reading of the report, the distribution of prizes to the successful competitors from among the members of classes took place. The meeting was afterwards addressed by Mr. Sheriff Bell, Mr. Robert Harvey, Mr. W. H. Ashcroft, Mr. John M'Pherson, Councillor Couper, and other gentlemen, and concluded with a vote of thanks to the chairman.

Miscellanea.

IMMENSE ENGINE AND ROLLING MILL.—An enormous engine and rolling mill are now in course of erection at the Dowlais Ironworks, South Wales. This engine supplies blast to six furnaces; its beam and adjuncts weigh upwards of 40 tons, and the fly wheel 35 tons. One rail mill is to make 1,000 tons of rails per week, another rough mill is to manufacture 700 tons per week, and 200 tons of rough bar iron are to be made by a bar mill. This enormous rail mill is constructed to roll both ways, at a speed of 100 revolutions per minute, and is to be capable of rolling bars of a length and section never before attempted.

MEETINGS FOR THE ENSUING WEEK.

MON. Royal Inst., 2. General Monthly Meeting.
WED. Geological, 8. I. Mr. Hull, "On a Comparison of the Permian and Triassic Rocks of England and some parts of Germany." II. Mr. Brough Smyth, "On the Extinct Volcanoes of Victoria, Australia."

PATENT LAW AMENDMENT ACT.

APPLICATIONS FOR PATENTS AND PROTECTION ALLOWED.

[*From Gazette, October* 23.]

Dated 23rd September, 1857.

2468. William Power, Rotherhithe—Improvements in steam-engine boiler furnaces and other furnaces for smoke prevention.

Dated 26th September, 1857.

2483. Pascal Balboni, Florence, Italy—A marine, submarine, and aerostatic propeller, being a new mechanism for propelling steam vessels on and in the water, applicable also to aerostatic purposes, combining speed and safety in steam-boats, and giving the power of directing balloons.

2486. Michael Henry, 77, Fleet-street—Improvements in the manufacture of artificial wine, vinegar, and brandy, part of which improvements is applicable in the manufacture of brandy generally. (A communication.)

Dated 28th September, 1857.

2493. William Bowler, 4, Seymour-place, Stapleton road, Bristol—Improvements in the manufacture of hats and other coverings for the head.

Dated 29th September, 1857.

2496. Earle Harry Smith, New York, U.S.—Improvements in sewing machines.

2500. Stephen Smith, Manchester—Certain improvements in coffins. (A communication.)

2504. James Welch, Southall—Improvements on carriages and portable railways, to facilitate their movement on common roads and other surfaces.

2506. William Edward Newton, 66, Chancery-lane—Improved apparatus for igniting gas or other lamps. (A communication.)

Dated 30th September, 1857.

2510. Auguste Bouret, Paris—Improvements in Pecqueur's loom for manufacturing fishing and other nets.

2512. James Paisley, Hele Works, Devon, and George Bertram, Edinburgh—Improvements in the manufacture of paper.

2514. Christopher Crabb Creeke, Bournemouth—Improvements in the construction or manufacture of earthenware pipes.

2516. William Sandilands, Inveresk, N.B.—Improvements in chimney cans or apparatus for promoting draught in chimnies.

2517. William Henderson, Bristol—Improvements in treating certain ores and alloys, and in obtaining products therefrom, and in recovering or reproducing all or part of the materials used.

2518. James Harris, Hanwell—Improvements in and connected with cocks and valves, especially adapted to preventing the bursting of water pipes from frost.

Dated 1st October, 1857.

2520. James Long and Joseph Long, Little Tower-street—An improved method of and apparatus for ascertaining and registering the depth of water and the pressure of steam.

2522. Josiah George Jennings, Holland-street, Blackfriars—Improvements in the manufacture of articles used for forming flues and air and water passages in buildings.

Dated 2nd October, 1857.

2526. Samuel Davies, Brilley, Hereford—Improvements in apparatus for heating the feed-water of steam boilers.

2528. Captain Henry John Childe Shakespear, H.E.I.C.S.—An improvement in the structure of carriages for military and other purposes.

2530. George Webster Shibles, Thomas Town, Maine, U.S.—Improvements in arranging and reefing the sails of ships.

2532. Joseph England, Beverley—Improvements in washing machines.

2534. John Henry Johnson, 47, Lincoln's-inn-fields—Improvements in the construction of iron bridges. (A communication.)

Dated 3rd October, 1857.

2538. John Atherton Molineaux and Joseph Nichols, Brighton—Improvements in pistons for steam engine and other cylinders.

2540. Augustus Seyferth, Paris—The employment of sulphuret of carbon for motive purposes, and engines and apparatuses for applying and regenerating the same.

2542. William Pursall, Birmingham—Improvements in the manufacture of eyelets.

Dated 5th October, 1857.

2544. George Duncan and William John Jellicorse, Litchfield-street, Birmingham—An improved smoke consuming furnace.

2546. Charles Reeves, Birmingham—A new or improved sword.

2548. Robert Atkinson, Corporate buildings, Newcastle-on-Tyne—Improvements in garments as part of male attire.

2550. Michael Henry, 77, Fleet-street—Improvements in apparatus or machines for raking and scraping or cleaning roads, streets, ways, and places. (A communication.)

2554. Athanase Victor Constant Regnauld, 39, Rue de l'Echiquier, Paris—A universal preservative medicine.

Dated 6th October, 1857.

2556. John Talbot Pitman, 67, Gracechurch-street—Improvements in apparatus for making candles and other analogous manufactures. (A communication.)

2557. Richard Hugh Hughes, Hatton-garden—Improvements in hydraulic connections of gas chandeliers, lanterns, or pendants.

2559. Edward Vigers, Bayswater—Improvements in the construction of wrought iron beams and girders.

2560. Richard Archibald Brooman, 166, Fleet-street—Improvements in apparatuses for taking photographic pictures. (A communication.)

2561. Conrad William Finzel, Bristol, and James Bryant, Plymouth—Improvements in cleansing animal charcoal, and in removing iron and other impurities therefrom.

2562. James Stoneham, Audenshaw, near Manchester, and John Pipler Lees, Ashton-under-Lyne—Improvements in uniting or connecting piping.

2563. George Thomas Robinson, Leamington-priors—A machine for obliterating postage stamps on letters, at the same time stamping the post marks and registering the number of letters so stamped.

2564. William Knapton, Albion Foundry, Monkbar, York—Improvements in gasometers or gas holders, and in the application thereof to railway and other carriages, and ships, for lighting the same with gas.

2565. Augustus Applegath, Dartford, Kent—Improvements in printing machines.

2566. James Warburton, Low Mills, Addingham, near Otley, Yorkshire—Improvements in combing wool and other fibres.

2567. Ebenezer Stevens, Cambridge-road—Improvements in machinery for making bread and pastry and other similar articles.
2568. Robert Romaine, Beverly, Yorkshire—Improvements in machinery for digging or cultivating land, part of which improvements is applicable to agricultural steam engines generally.
2569. William Gossage, Widnes, Lancashire—Improvements in the manufacture of sulphuric acid.

Dated 8th October, 1857.

2570. Alexander Boyd, Lees Brook, near Oldham—Improvements in machinery for spinning and doubling.
2571. Thomas Forsyth, Manchester—Improvements in the construction of metallic pistons.
2573. Job Allen, Commercial road, and John Young, Shadwell—Improvements in preventing oscillation in carriages upon railways.
2574. Thomas Grubb, Dublin—An improved photographic lens.
2575. Charles Barlow, 89, Chancery-lane—Improvements in buoyant or life preserving garments. (A communication.)
2576. William MacNaught, Rochdale, and William MacNaught, Manchester—Improvements in steam-engines.
2577. William Grindley Craig, Gorton, Lancashire—Improvements in the manufacture of railway carriage and other wheels formed of cast metal, or having cast metal naves or bosses.
2578. Daniel Reuver, 109, Boulevart de Waterloo, Brussels—Improvements in propelling and steering ships and other floating bodies.
2579. James Cocker, Liverpool—Improvements in the manufacture of wire.
2580. William Richard Todd, junr., Hull—Improvements in manufacturing or preparing washing blue.
2581. James Cocker, Liverpool—Improved apparatus for heating or annealing wire, wire iron or rods, or sheets of iron, or other metals.
2582. Elbridge Foster, Connecticut, U.S.—A new and useful or improved life-preserving berth for navigable vessels.
2583. Thomas Massey, 4, Birchin-lane, and Thomas Savage, 19, Soley-terrace, Pentonville—An improvement in apparatus for ascertaining and recording the speed of ships.
2584. James Wadsworth, Hazelgrove, near Stockport—Improvements in the production and management of artificial light and heat, and in certain parts of apparatus applicable thereto.

Dated 9th October, 1857.

2585. George Scott, Philadelphia, U.S.—Improvements in steam generators.
2586. Samuel Walmsley, Heaton Norris, Lancashire—Improvements in the construction of footsteps for upright shafts and spindles.
2587. Fennell Herbert Allman, Mornington-place, Regent's-park—Certain improvements in the construction of valves and taps.
2588. Richard Davies, 5, Pilgrim-street, Newcastle on-Tyne—Improvements in washing machines.
2589. John Harland, Shield-street, Newcastle-upon-Tyne—Improvements in purifying and cleansing clay, and in the manufacture of bricks, tiles, and similar articles therefrom.
2590. Antoine Marie Poisat, Paris—A machine for preparing wood to be reduced into pulp for the manufacture of paper, card, and pasteboard. (A communication.)
2592. Henry Brown and William Brown, Albert-street, Newington-butts—An improved whip socket.
2593. William Edward Newton, 66, Chancery-lane—Improvements in stirrups or stirrup irons. (A communication.)

Dated 10th October, 1857.

2594. Charles Barnard and John Bishop, Norwich—An improved washing machine.
2595. Francis Alton Calvert, Manchester—Improvements in machinery for ginning cotton and for burring and cleaning cotton, wool, and other fibrous materials.
2596. George Miller, Salford—Improvements in apparatus for heating and ventilating.
2599. Alfred Barlow, 25, Darley-street, Leeds—A Jacquard apparatus dispensing with the use of cards, and the usual mode of designing for figured weaving.
2600. William Henry Myers, 202, Whitechapel-road—An improved means for signals on railways, being a system of signals for railway trains in motion or otherwise, comprising communications between guards and engine-drivers, station-masters, and others, the same apparatus being applicable as fog, danger, and accident signals, the same apparatus being also a communication from station-masters or their servants, including point and signal men, to guards and engine-drivers for passengers by means of glass or metallic pendant signals.
2601. Robert Porter and James Porter, Blackburn—Improvements in machinery for the manufacture of bricks.
2602. Richard Ussher, Rath Boro, Killanne, Wexford, Ireland—A machine for imparting motive power to thrashing machines, and such like agricultural implements.
2603. Henry Edwards, Dalston—An improved vessel or feeder for administering food and medicines.
2604. Frederick Mortimer Butler, New York, U.S.—Improvements in ventilators or wind guards for chimneys and other purposes.

Dated 12th October, 1857.

2605. Franklin Prestage, Westbury, Wilts—Improvements in the furnaces of locomotive and other steam boilers.
2606. John Gray, and John Wilson Gray, Rathgar, Dublin—An improved means of causing signals to be made on railways, and of otherwise preventing certain classes of accidents on same.
2607. George Beard, Pall-mall—Improvements in mechanism for producing impressions on paper or other surfaces.
2608. Vincent Wanostrocht, St. Swithin's-lane—Improvements in converting muskets and other fire-arms into rifled fire-arms. (A communication.)
2609. William Calvert, Residentiary-houses, St. Paul's—Improvements in obtaining motive power by the action of the wind.

Dated 13th October, 1857.

2611. William Edward Newton, 66, Chancery-lane—Improved apparatus for roasting or torrefying coffee or other substances. (A communication.)
2613. Michael Henry, 77, Fleet-street—Improvements in apparatus for playing loto. (A communication.)
2617. John Harwood Simpson, Petersham, Surrey—Improved machinery or apparatus for making bands or ropes of straw, hay, or other fibrous substances.
2619. Vincent Wanostrocht, 10, St. Swithin's-lane—Improvements in obtaining fatty and oily matters by distillation. (A communication.)
2621. William Sharman, Sheffield—An improved metallic compound, applicable to the manufacture of various useful and ornamental articles.

Dated 14th October, 1857.

2623. Edward Keighley, Bradford—Improvements in the preparation and use of dye liquids.
2625. John Field Swinburn, Birmingham—Improvements in fire-arms. (A communication.)
2627. Edward Owen, Blackheath—Improvements in the preparation and manufacture of manures.
2629. John Middleton, Hyde, Cheshire, and William Rylance, Whitefield, near Manchester—The application of a certain metal or material to the manufacture of shuttles, bobbins, and tubes.
2631. Joseph Parker, Southampton—An improved method of fitting and working Venetian and other similar blinds used as ventilators or screens, or both.
2633. Captain Godfrey Rhodes, 94th Regiment of Foot, Ship street Barracks, Dublin—A parabolical or bell shaped or other shaped camp or field tent, without any centre support or pole.

WEEKLY LIST OF PATENTS SEALED.

October 23rd.

1143. Matthew Dunnett.
1145. David Milnes.
1149. Jaques Richard.
1153. Wm Colborne Cambridge.
1159. Lieut. Ed. Manico, R.M.
1171. James Simpson and Edwin Rimmer.
1188. William Levesley.
1200. David Chadwick and Herbert Frost.
1202. Charles Pascall.
1208. Joseph Bottomley, Christopher Hodson, and William Fielden.
1231. John Henry Johnson.
1249. Tertius John Cooke.
1252. John Stanley.
1266. Robert William Sievier.
1279. Arthur Kinder.
1311. William Player Miles.
1440. Meyer Drukker.
1611. Peter Armand le Comte de Fontainemoreau.
1841. Marguerite Antoinette Laurent.
2059. Jules Dortet and André Barthelemy Denis.
2229. George and William Steell.

October 27th.

1181. Polydore de Keyser.
1183. Edmund F. Barnes.
1185. John Macintosh.
1190. Heinrich Hochstaetter.
1198. John Ramsbottom and John Bailey.
1213. Henry Ball.
1218. Samuel Mortimer.
1221. George Powers.
1225. John Collins.
1229. Edward Hawkes.
1232. Alfred A. Blandy, M.D., D.D.S.
1233. Richard Leake and Matthew Sykes.
1240. Alexander John Paterson.
1246. William Edward Wiley.
1250. John Fox.
1255. William Edward Wiley.
1259. George Travis.
1269. William Bond Pauk.
1361. Richard Dugdale Kay.
1374. Robert Porter Walker.
1379. Sophia Sands.
1387. Henry Trappes.
1432. William Owen.
1633. Alfred Vincent Newton.
2011. Andrew Scott.

Patents on which the Stamp Duty of £50 has been Paid.

October 20th.

2152. Richard Keefe.

October 21st.

2256. John Maddox, Ed. Gardner, and John Dyer Green.
2266. Joseph Hopkinson, jun.
2275. Colin Mather.
2297. Edward Lindner.

October 23rd.

2282. John Healey, John Foster, and John Lowe.

October 24th.

2272. Richard Roberts.

WEEKLY LIST OF DESIGNS FOR ARTICLES OF UTILITY REGISTERED.

No. in the Register.	Date of Registration.	Title.	Proprietors' Name.	Address.
4028	Oct. 28.	Chas. Rowley & Co.'s Cambridge Belt Clasp	Chas. Rowley and Co.	Birmingham, London, & Manchester.

Journal of the Society of Arts.

FRIDAY, NOVEMBER 6, 1857.

NOTICE TO MEMBERS.

The One-Hundred-and-Fourth Session of the Society, will commence on Wednesday, the 18th inst.

The Chair will be taken at Eight o'clock on the following Wednesday evenings:—

1857.—November	...	...	18	25	...
,, December	2	9	16	...	...
1858.—January	...	13	20	27	...
,, February	3	10	17	24	...
,, March	3	10	17	24	...
,, April	7	14	21	28	...
,, May	5	12	19	26	...
,, June	...	...	...	...	30*

For the Meetings previous to Christmas, the following arrangements have been made:—

November 18.—Introductory Address on the Opening of the One-Hundred-and-Fourth Session, by the Chairman of Council.

⁂ On this evening the Medals which were awarded by the Council for Papers read at the Weekly Evening Meetings during the last Session, and for articles submitted to the Society's Committees, will be distributed.

November 25.—Dr. Forbes Watson. "On the Food Grains of India."

December 2.—Mr. Apsley Pellatt. "On the Comparative Heating Powers of Coal and Coke, in reference to Economy in Fuel and the Smoke Nuisance."

December 9.—Mr. S. Sidney. "On the Progress made of Late Years in the Manufacture of Agricultural Machines and Implements."

December 16.—Mr. John Underwood. "On the History and Chemistry of Writing, Printing, and Copying Letters, and a new plan of taking Copies of Written and Printed Documents, Maps, Charts, Plans, and Drawings."

The subjects to be discussed at the Wednesday Evening Meetings will be regularly advertised in the Journal, some time in advance. By this means it is hoped that the largest amount of information that is possible may be brought together in the necessarily limited time at the disposal of the Meeting.

It is exceedingly desirable that Members should aid the Council in procuring Communications to be read at the Evening Meetings, or for publication in the Journal. Our Colonies, their Wants and their Products—Improvements in our Home Industries—Economical adaptations of machinery or processes to Manufactures—The production of novel or improved articles of Commerce—The employment of new substances, or new methods of treating those hitherto used in the Arts and Manufactures, are some among the many subjects to which attention may be directed.

INDIAN PRODUCTS.

The following letter, with the accompanying Memorandum, has just been received from the Agricultural and Horticultural Society of India:

Dear Sir,—I have sent to your address by this mail (care of Messrs. Grindlay and Co., 63, Cornhill), a parcel containing the following:—

First.—Specimens, scoured and unscoured, of Arracan raw silk. You will find full particulars regarding this silk in the *Journal* of our Society, Vol. VII., page 281. The object of sending these specimens to the Society of Arts is to test the English value of the commodity, as ordinarily produced and offered in the Arracan and Pegu markets for sale, by submitting them to practical parties. N.B. The specimens to be returned with the reports on them.

Second.—Specimens of a product from Moulmein, in the Tenasserim province; termed "Pevai-nyet," useful for caulking purposes. For further particulars see the enclosed memorandum.

Third.—A small packet, to the address of F. Smith, Esq., of the British Museum, containing specimens of the little bees which make the above product. Please send on the packet and enclosed letter to Mr. Smith,

I am, dear Sir,
Yours faithfully,
A. H. BLECHYNDEN,
Secretary A. and H. Society.

Metcalfe Hall, Calcutta, September 21st, 1857.

Memorandum Referred to in the Foregoing Letter.

In April, 1857, Sir Archibald Bogle, Commissioner of the Tenasserim provinces, forwarded to the Agricultural and Horticultural Society of India a specimen of a substance called "Pevai-nyet," procurable at about one anna (1½d.) per lb. in those provinces. Sir Archibald states that this material has only to be moistened with earth oil till of the consistence of paint, and then spread with the fingers on a bit of cloth on the cracks of the roof of a house, to make it quite waterproof, and to stop all leakage whatever, and it dries in an hour or two. Sir Archibald adds that having found it most valuable, he thinks it very desirable to bring it to the notice of the Society.

Sir Archibald having left India for Europe shortly after the receipt of the above specimen, the Society preferred a request to another member resident in the Tenasserim provinces, the Rev. C. S. Parish, for further information as to the nature of the material in question, whether vegetable or mineral, and for any additional particulars he could afford. In reply, Mr. Parish has been kind enough to supply the following interesting information, in a letter dated from Moulmein, May 20th:—

"The substance about which you seek information is, as Sir A. Bogle stated, commonly procurable in the Moulmein Bazaar, and at about one anna a pound. I lately bought, I think, 5 Viss for 1 rupee (2s). It is not a vegetable substance, but it is the result of the labours of a small bee. Probably, however, it is the mixture of various gums and resins gathered by the bee. Fortunately, since receiving your letter, I have met with a small colony of the Dammer bee at work in a hole of an old teak post. I have the pleasure to send you by this mail a small piece of the substance, for identification, taken out on the point of a knife; also two specimens of the industrious little creature itself, enclosed in a glass cell. I am not an entomologist, but shall be glad to know the name of the *opifex*. If any of your entomological friends think the species of interest, I will try to catch them some more, as I believe they have no sting. I have not, indeed, submitted them to the microscope, but though numbers settled on me, and flew round me, as I disturbed them in their work, I felt no evil consequence. The bee makes his nest of this substance, which is at first soft and plastic to the fingers, and extremely glutinous, but afterwards on exposure to the air becomes dry, hard, and brittle. The nest, I believe, is made indifferently in a hollow tree, in a hole in the ground, or, as in the present instance, in that of an old post. When bought, it is commonly in a large irregularly-shaped lump, rudely honey-combed, mixed with much extraneous matter. It is soluble in oil—any oil, I fancy; at least, I find that olive oil answers the purpose of detaching it from the fingers as well as wood oil.

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* The Annual General Meeting; the chair will be taken at 4 o'clock. No visitors are admitted to this meeting.

"It is a well-known and commonly-used substance here; but, though frequently noticed, mistakes, as to its true nature, have often been made, chiefly owing to the fact that the name of *Dammer* is given to it in the Bazaar by the natives of India, who sell it in common with many other resins and gums, which in appearance and quality it resembles. It is not *Dammer*, though, if you ask for *Dammer* in the Bazaar, it is as likely that you will have this substance offered to you as any other. The Burmese know it only as *Pevai-nyet*. They use it for caulking generally, mixed with wood-oil over a fire, and it answers its purpose admirably in the case of wood-work, but whether of Pucka or Chunum work also, I cannot say."

The little insects have been forwarded for examination to Mr. Frederick Smith, of the British Museum, and the specimen of the substance prepared by them is now submitted to the Society of Arts, with the request that they will have the kindness to refer it for trial to practical men interested in such matters, and communicate the result to the Agricultural and Horticultural Society of India.

CHEMISTRY IN THE WINE CELLAR.

The following paper was read at the annual meeting of the Hunter River Vineyard Association, New South Wales. By Mr. Frederick Muspratt, F.C.S.L.

I take advantage of the opportunity to diffuse information not accessible to all, which may prove useful to my fellow *vignerons*. I am in perfect accord with my preceptor, Baron Liebig, when he asserts that mere empiricism can never enable any one to excel in presenting an industrial product acceptable to the consumer, and profitable to the maker. My object shall be to bring to our aid the truths and researches of science. I am much indebted to the works of Baron Von Babo, who is known in Europe as one of the most successful wine producers. The German wine maker has difficulties to contend with, which need not be feared in this country; and here the sudden changes of climate and intense heats cause evils which I will investigate more thoroughly.

Cellar management requires much more study than is generally supposed. The isles of Greece, Italy, Spain, &c., possess quite as fine a climate as this, and in some respects more favourable to the growth of the vine, but when it is left to the manipulations of the ignorant farmers of the interior, what do they produce? The table wine of Madrid tastes of tar, that of Huesca of ink, the wine of Lanarka is resinous, and several country wines are glutinous.

All these evils may be remedied or avoided by proper care, and a knowledge of the discoveries which have been made in chemistry during the last few years, causing the wines of Europe to be more generally palatable.

The production and stability of all organic substances depend on the affinities of four elements—oxygen, hydrogen, nitrogen, and carbon. Three of these, when uncombined with other substances, are gaseous, and invisible; the fourth, when pure, is a solid, but when combined with others assumes the form of a gas.

This ready capability of changing their proportions, and this volatility, facilitate the absorption and distribution which is perpetually taking place, and the elimination in the form of gas of whatever may not have been required in the formation of the plant. All life, whether vegetable or animal, depends on the constant transition of the substances of which it consists. If this is in any way interrupted, eramacausis sets in.

Though these elements form the principal basis of all existence, they must be supported by less volatile substances, of which the proportion required for the continuance of organic life is much smaller, yet most necessary. These are silica, alumina, lime, magnesia, potash, soda, iron, manganese, sulphur, and phosphorus.

These substances unite in every organic form, but they cannot of themselves blend so as to attain the object of the organism. It is the vital power of each organic being, which as it were acts as architect, in merging into form the necessary substances. It is on the vital power of each single element, that the form it shall assume depends, for entirely different substances may be produced by the same materials.

The elements obey, more or less, the general chemical laws, but there are some undisturbed by the vital power in the organism, that are not so prominent, and to a certain extent appear to be debarred from performing their higher functions; it is only in the growth that the action of such elements commences, and this is different in the various species, producing compounds containing the elements in different proportions. All contribute, however, to the development and preservation of the perfect plant.

With regard to their influence upon the animal kingdom, the basis of the nourishing powers of plants depends on these elements. The more highly organized animals do not take their nourishment directly from the indigenous plants. They live on that which the plants have amalgamated by artificial aid from the earth and the atmosphere, and when we take animal food the source is still indirect. In the vine, the wood, foliage, branches, blossoms, and fruit are formed from nearly the same elements; the grapes, until they are parted from the stalk, partake of its life; in this state there is no admixture. After separation their nature changes; saccharine matter, glycocoll, tannin, &c., become prominent; the substances are now subject to atmospheric influence; the separation and decomposition of elements commence of themselves, and form alcohol, yeast, &c., or pass into the atmosphere as carbonic acid. This is the process of fermentation, where the quantity of water present must regulate the kind of decomposition which will ensue.

It would be out of place in communications which do not profess to enter into the minutiæ required in a handbook, to dilate on the fermenting process, or to detail the actions of the nitrogen which is contained in the yeasty or albumino-glutinous substances, and the consequent formation of various ammoniacal compounds. The products are alcohol; carbonic acid gas, part of which remains in the solution, and imparts the prickly taste to young wines; lactic acid, formerly considered to be acetic acid, and similar in composition to sugar; acetic acid, produced by the action of oxygen on alcohol at a high temperature; different odorous volatile substances, partly ethereal, partly similar to volatile oils; yeast, the residue of the azotic substances which excited fermentation, but not to be confounded with any excess of ferment there might be; ammonia, formed from the azote of the ferment, uniting with the hydrogen which becomes free during the decomposition of the water—this unites with malic or other acids.

Of non-azotic substances of the grapes, contained in the cellular tissues, there are dextrine, starch, sugar, pectine, pectic acid, and extractive substances, which play an im portant part, as in them are contained the elements of bouquet, colouring matter, and vegetable acids, the most important of which are tartaric, citric, malic, tannic, and gallic acids.

Of azotic substances, there are glycocoll, albumino-glutinous substances, &c.

Of inorganic substances, there occur hydrochloric, phosphoric, and sulphuric acids, alumina combined with tartaric acid, potash, magnesia, iron, and traces of peroxide of manganese.

The proportion in which these different ingredients stand towards each other is highly varied, and depends principally on the nature of the season in which the grapes have matured.

I have found this year that the sugar in the must ranged from 22 to 28 per cent. This wide range is owing to my having had grapes from four vineyards, on perfectly different soils: I need not describe them more fully, as they have been thoroughly amplified in previous accounts of the proceedings of this Society. The highest number refers to the grapes from the Irrawang vineyard, the lowest to those from the vineyard on the Williams river, that were planted by Mr. King. I also had some grapes from the Tureela vineyard, which musted equal to the highest, but its mean was 26 per cent. glucose or grape sugar. The deduction, by calculating the specific gravities, is, that the wine produced will range from 14 to 21 per cent. alcohol.

The mucous, &c., amounts, according to Walz's investigations in Europe, to three per cent.; but, owing to the difficulty in getting suitable simple apparatus here, to discover the mean content, I have not been able to arrive at accurate conclusions; but I would imagine the average to be higher here, as the mineral and vegetable salts, which average three per cent. in Germany, indicate in this country five per cent. and upwards; the rest is water.

It is only some two months after the vintage, when the fermentation is insensible, and the excess of chlorophyll, unctuous, and resinous matters have been removed, that the practised person will begin to have a foretaste of what will afterwards be developed. Time is then required for the ripening, but there is a period at which all wines, if left to themselves, deteriorate: the spirit disappears or is decomposed, the resinous matters become prominent, and impart their flavours. A young powerful wine, being richer in alcohol, is more intoxicating; but where this has merged into ether, an older wine is more exhilarating.

In a perfect wine, neither the sugar, the alcohol, nor the acid should be in excess, but always maintain a certain proportion towards each other. In unctuous wines the dextrine by degrees merges into sugar. With these there are flavours, the œnanthic, the aromatic, the bouquet, which differs in its ingredients from the aromatic taste, the sharp, and the varnish flavour. In hot countries the sugar predominates, and as the gluten is not proportionate, it often happens that the wines do not yield so much bouquet, though the aromatic flavour and perfume may be very prominent. The basis of the most celebrated vinous flavours, is the most perfect development of the œnanthic ether, which is produced during the fermentation by a combination of œnanthic acid and alcohol. Foreign matters interfere with the formation of this æther in a pure state. Some bouquets may be produced by an after decomposition of the extractive substances with ammonia, or with some of the ethers.

It is possible by a rational treatment to ennoble almost all wines, without having recourse to sophistication. All seasons not being alike, the wine-maker ought to understand these matters, by studying the requirements of the plant in the vineyard, by knowing how to concentrate when there is too great an excess of water, or by the addition of certain ingredients which, under favourable circumstances, would be naturally contained in the plant.

The increased proportion of sugar is not coincident with a diminution of acid. Really unripe grapes can therefore never make a wine. In Europe there may be seasons when the wine-makers would obtain a wine more capable of developing a bouquet, by gathering the grapes at a certain point of ripeness when all would be alike; but in a country such as this, where the rays of the sun act with such power, the outer grapes might be in the state required, while the inner ones would be perfectly green, and totally unfit for any wine-making purpose. It is, therefore, necessary to delay the gathering longer than is usually done in this country to produce a fair wine. If allowed to proceed to an eramacausis, and if not disturbed or acidulated by rain, then is the greatest amount of saccharine matter obtained, which is generally developed from the cellular tissues and the dextrine.

It would be superfluous at present to enumerate the various treatments of the vine, as in this country they could not be acted upon while wages are so excessive.

The stalks contain various substances, which, when mixed with the must, will injure the wine; on the other hand they contain gallic acid, which serves to precipitate the glutinous matter. The fermentation is also stronger and more regular if the stalks are mixed with the pressed berries, which is explained by the particles which excite fermentation being more diffused. In red wine the tannin affects the taste considerably, either in itself, or owing to an ether formed from it; it has also the advantage of acting as an astringent, and strengthens the body against the relaxing heat of the sun. This is the cause of the expression that such wines have a cooling effect. If the must cannot be immediately pressed, it is well to separate the stalks, as too long a decomposition of them tends to give a woody flavour.

The time when the must ought to be separated from the murk is of great importance, and depends on the kind of wine to be produced. With red wine the murk ought to remain with the must till the alcohol is developed by fermentation, and is in a state to effect the extraction of the colouring matter. With luscious wines the must ought to remain longer in contact with the stalks, as the gallic acid serves the more completely to precipitate the glycocoll and gluten. The development of bouquet does not depend on the skins and stalks.

To those who might wish to make some determinations a few directions will prove useful; and as there are many anomalies as yet unexplained about the wines of Australia, I propose during the next year to institute a series of analyses, from which I doubt not much that is still uncertain will be explained. It is by the aid of chemistry alone that this branch of industry will be brought to perfection—that science which has of late years advanced so greatly all arts, manufactures, and professions—the evidences of which are so palpable that it would be useless for me to enumerate them.

The free acid is determined by acetate of lead. Concentrate the must to about a third, and treat with absolute alcohol, the albumino-glutinous substances remain insoluble.

As nature, in particularly favourable seasons, aids in the transposition of a middling wine into one of greater body, of a poor wine into one of better quality, so may the wine-maker improve the quality by separating excessive acid, or water, as also by the addition of certain ingredients homogeneous with the grapes, and bring the wine of a poor year nearer to that of a better one.

There are three ingredients of the wine, the proportions of which in the must will affect its quality. These are glucose or grape sugar, alcohol, and acid. It can never be considered as a sophistication of the wine, when the must is enriched with substances which are the same as the materials in the grape, and when it depends on the chance of the weather their being present in more or less quantity in the grape itself. The must may be made more saccharine by using gypsum, to free it from water, or adding starch sugar, which is of the same composition as grape sugar. Alcohol may also be added before fermentation, but it stays the process, and though generally used in Spain and Portugal, is not to be recommended where one seeks to retain delicacy of flavour. An excess of acid may be removed by neutralising with lime, or by removing the murk quickly, and skimming off the mucous matters as rapidly as possible, as the vegetal acids are generally in combination with it. A little observation will show the wine-maker how this is to be effected. Formerly oxide of lead was used, but the resulting lead compound was poisonous, and the method most reprehensible.

It is of importance to separate the mucous as early as possible after the insensible fermentation has set in, as it is the mother of many diseases. This is effected by frequent rackings. Even excessive sulphuring at this stage will not injure the wine, as it is precipitated with the gluten, and it is the best preventive of mustiness, which is very general, especially with red wines. These rackings are complete, and the object effected, when the red wine will stand some time in a glass without inspissating, or when a white wine does not assume an iron red colour under the same circumstances.

No old wine ought to be sulphured, as it contains no precipitant. In such cases nutmegs are burnt in casks. as they contain an ethereal oil which has a similar effect, but care must be taken to prevent flavour being imparted to the wine. Younger wines required for immediate use must also not be sulphured, as it causes headache and injures the health.

At an early period an attentive observer will notice a taste more or less resembling coffee, which indicates the bouquet into which it will afterwards merge; there is also often a bitter taste perceptible, which demonstrates the presence of a citrate or salt of magnesia. After clearing, the alcohol gradually combines with different acids, and the various ethers result. The hydrous ingredients, with the aid of carbon and oxygen, merge into resinous matters, and often portions of the saccharine matters change into lactic acid.

With light wines that age quickly, and will not keep, it is advisable to burn some spirit in a cask previous to filling with such wine, as by this means the blending is more intimate.

Harshness in wine proceeds from tannin being in excess. Isinglass, or white of eggs serves by degrees to precipitate this; but if allowed time to mellow properly, the glutinous substances in the wine itself will effect the same object.

In bad seasons a wine may be formed in which acid predominates, at the same time rich in alcohol. With long rest this may become very good, as the bitartrate of potash settles by degrees, after the excessive acid has formed ethers, which improve the flavour. If one wishes to hasten the separation of the excess of tartaric acid, tartrate or carbonate of potash may with judicious management be applied.

If a wine gets sticky and inspissated, and will not yield to the ordinary mode of clarifying, this proceeds from an excess of glycocoll, and a deficiency of gallic acid. In this case suspend for some days in the wine a bag of gall nuts, till a test with perchloride of iron indicates the attainment of the object. Rack, and it will clarify with isinglass. If obstinate, the operation must be repeated. When wine becomes clammy, and oily, which is owing to an excess of gluten, and a deficiency of alcohol and acid, dissolve twelve ounces of bitartrate of potash, and the same of sugar, in a mulled wine; put this into an empty cask, diffuse it, and fill with the wine to be operated upon; if not effectual, when repeated, add an equal quantity of salt, and about four ounces of the ashes of the vine stalks.

It is well known how wine becomes vinegar, but there are cases frequent in this country where every precaution has been taken to preclude the access of air, where the wine assumes a certain tart taste owing to the conversion of sugar into lactic acid. To test this, saturate a sample of the wine with carbonate of magnesia, and allow it to rest two days. If the taste of the supernatent liquor is bitter, it is owing to the presence of acetic acid; if not, there is lactic acid present; in the latter case the wine itself may be treated with carbonate of magnesia. Frequent racking and good cellars will prevent this evil.

If wine be not too far gone, the acetic acid may be neutralised by oyster shells, and triturating with isinglass; but if this is not done with care and knowledge, the wine is apt to get a flat taste.

When casks have not been well scalded, and afterwards rinsed out with cold water, the wine has a peculiar disagreeable flavour of wood. With age in bottle this will disappear, or it may be removed by several rackings into sulphured casks and clarifying. If the wine assumes a smoky or burnt taste, it should be mixed with some sweet must, and subjected to renewed fermentations.

Clarifying is a most important operation in the management of wine, as a great advantage is gained by a proper application of it, but from a want of knowledge injury may result. Ill-judged application of the clarifier is probably the cause of the impression that clarifying weakens a wine, while it has quite a contrary effect; a well clarified wine first developes the aroma and bouquet, when the taste is no longer acted upon and weakened by mucous.

Clarifying has different objects. With perfected wines it separates any remaining gluten, and extractive matter, which inspissate the wine after bottling. It precipitates the excessive acid from rough wines. In diseased wines it separates those substances which have caused the defect. Badly coloured wines may recover their proper colouring if well clarified.

The wine-maker must use his own judgment as to the quantity of the clarifier he ought to apply, apportioning it according to the nature of the wine he is operating upon. Clarifying by mechanical means, is simply filtering. Chemically, isinglass is the simplest and best clarifier; it coagulates readily in the wine, leaves no taste, and is preferable to milk, because it does not weaken the wine. The tannic acid unites with the pure glue, forms an insoluble compound heavier than the wine, which, in finely-divided particles, acts as a net, and in descending draws down with it the glycocoll, extractive matter, &c. If the isinglass finds no tannic and gallic acids, it is ineffectual, and the want must be supplied by gall nuts, or adding some of the pressed wine.

In the purest wine there is some mucous, but it is soluble; its presence is indicated by inspissation when tested with perchloride of iron.

The difference between sophistication and improvement in a wine consists in this:—A wine may be improved by correcting any misproportion in the must before fermentation, by adding vegetal substances containing the requisite ingredients, but substances not subjected to fermentation do not properly merge into the wine.

Wines are sophisticated with iris root, elder blossoms, lime blossoms, citron, orange peels, bitter almonds, skins of ripe quinces, black currant, tincture of cherries and plums. Alum is sometimes used, to give the uninitiated an idea that there is body in the wine, because it has a shrivelling-up effect, but a judge can easily tell if it be present.

The result of numerous observations in Europe have proved that the earlier the blossoming of the vine the better the quality of the product. This question might with advantage be inserted with others in the Society's papers.

As different musts have varied constituents, it is easy to understand why the winemaker should use his own judgment in mixing them, instead of keeping the must of any particular grape by itself; also why the pressed wine should be kept separate from the other wine, and how they should be mixed at discretion, according to the requirements of the winemaker. A reference to the different chemical combinations and decompositions I have described will explain this.

To enable a wine to develope its beauties with age, and to attain that perfection which we all recognise when we meet with it, there must be cool cellars—caves, if possible. It must never be let alone for any length of time, and if a little newer wine be added at intervals, the elimination of the ethers will be more complete: the œnanthic ether, which heightens the vinous flavour; the batyric ether, which in sherry gives the peculiar bouquet; or the acetic ether of the clarets; the acetate of amylls of many of the French white wines; and several other compounds, which it would serve no purpose to enumerate. It is absolutely necessary that a person should have well-seasoned casks, which will not absorb the elements of those flavours, aromas, and bouquets.

METROPOLITAN DRAINAGE.

It will be remembered that the First Commissioner of Her Majesty's works referred to Captain Douglas Galton, R.E., and Messrs. James Simpson, and Thomas E. Blackwell, certain questions relating to the Main Drainage of the metropolis. Those gentlemen, in the course of their inquiry, deemed it necessary to secure the assistance of Dr. Hofmann, Chemist to the Museum of Practical Geology, and Mr. Henry Witt, assistant chemist there, in making the chemical investigations lately connected with the subject. These gentlemen have made their report, which has been presented to Parliament, and is now printed as one of the Sessional Papers. The experiments were continued over a space of four months, during which the influence of the sewage on the Thames water, the composition and value of the sewage, the principal methods proposed for utilisation and deodorisation of it, and the treatment of sewage in its sanitary aspects, were carefully investigated. The details are given at considerable length, with all the analytical numbers upon which the results are based, so that any one interested may examine and interpret for himself the foundations of the statements made. The following are the conclusions arrived at, under the five heads, as suggested in the original letter of reference. The authors sum up the principal results as follows:—

I.—INFLUENCE OF THE SEWAGE ON THE COMPOSITION OF THE WATER OF THE THAMES.

(*a.*) Owing to the very great dilution of the sewage by the water of the Thames, chemical analysis indicates but a slight difference in the composition of the river water before and after pollution.

(*b.*) Contrary to what might have been expected, the influence of the sewage scarcely increases the *quantity of dissolved organic matter.*

(*c.*) The presence of sewage perceptibly raises the proportion of mineral constituents, and especially of common salt.

(*d.*) The amount of *insoluble organic matter* which is present in the *mud suspended* in the river, *steadily increases* with the degree of contamination.

(*e.*) The offensive character of the river water, the disengagement from it (especially during hot weather) of effluvia, not only highly offensive, but also exceedingly prejudicial to the health of the inhabitants of the districts lying along the river's banks, is *chiefly caused by the putrefaction of the organic matter, dissolved and insoluble,* which is diffused through the water.

(*f.*) The *intensity of this putrefactive decomposition* which the organic matter present in the water undergoes within the metropolitan area, arises from the constant supply of putrescible matter, partly *by the influx of the sewage,* but more especially by the *vast accumulation of the black sewage mud* which has gradually collected in the bed of the river.

II.—MEAN COMPOSITION AND AGRICULTURAL VALUE OF THE SEWAGE.

(*a.*) According to experiments made on specimens which represent its mean composition, the London sewage contains, on an average, 102·8 grains per imperial gallon of total solid constituents, of which 72·1 grains are mineral, and 30·7 grains organic matter.

(*b.*) In these 102·8 grains, the following quantities of substances valuable in an agricultural point of view, are present:—

Nitrogen	6·7
Phosphoric acid	1·8
Potash	1·0
Organic matter	30·7
Total	40·2

(*c.*) The *total solid matter,* when entirely separated from the water with which it is diluted, would have a money value of £6 0s. 3d. *per ton;* that of guano being taken at £11.

(*d.*) Of the valuable matter, six-sevenths are present in the liquid portion, only *one-seventh* existing in the insoluble, or suspended form.

(*e.*) From the knowledge of the quantity of these valuable constituents contained in a given volume of sewage, it has been calculated that the *money value* of 100 *tons of sewage,* supposing all these bodies capable of separation, would be in its original condition 17s. 7d., or 2d. per ton; and that, therefore, the whole sewage of London is worth £3,796 per diem, or £1,385,540 per annum.

(*f.*) These numbers are, to a certain extent, confirmed by the calculation of the value of the solid and liquid excrements of the whole population of London.

(*g.*) The foundation of this calculation is, moreover, confirmed by the analyses of a variety of specimens of sewage, made on different occasions, both by ourselves and by others.

(*h.*) The chemical composition of the sewage of Edinburgh, and also that of Leicester, differs but little from that of the London sewage.

III.—UTILISATION OF SEWAGE FOR AGRICULTURAL PURPOSES.

Manufacture of a Manure from Sewage.

The following, among the many patented processes for the manufacture of manures from sewage, are those which, in accordance with the wishes of the Referees, were specially selected for examination, viz:—

(A.) Treatment of sewage with lime.

(B.) Treatment of sewage with a mixture of lime, sulphate of alumina, and charcoal (Stothert and Gotto's process).

(C.) Treatment of sewage with charcoal (Jasper Rogers and Richard Dover's processes):

1. Filtration of sewage through charcoal.
2. Agitation of sewage with charcoal.

We were also directed to report our opinion upon—

(D.) Treatment of sewage with a magnesian salt (Sir James Murray's process).

The following are the conclusions at which we have arrived under this head:—

(*a.*) With respect to process (B.), Messrs. Stothert and Gotto's, we find that the cost of the materials employed, irrespectively of working expenses, nearly equals the money value of the manure produced; whilst in process (C), 1. Filtration through charcoal, the cost of the materials very considerably exceeds the money value of the manure obtained. These processes cannot, therefore, be entertained, if the object be to manufacture a manure as a commercial speculation.

(*b.*) The magnesia process was not experimentally examined: nevertheless, our researches into the nature of sewage, together with the knowledge of the well-established chemical properties of the ammonio-magnesian phosphate, especially of its solubility in water and other menstrua, enable us to state that, owing to the extreme dilution of the sewage, the addition to it of a magnesian salt would produce either no precipitate of the ammonio-magnesian phosphate at all, or only of a most minute quantity; so that the manure produced by this process would essentially consist of the suspended matter of the sewage, which might as easily be collected by simple subsidence, and which contains only one-seventh of the valuable constituents of sewage.

(*c*.) With reference to the two remaining processes, viz., treatment with lime (A.) and agitation with charcoal (C. 2.), we find, from our experiments made on a small scale, that the value of the manure produced considerably exceeds the cost of the materials employed. However, on going minutely into all the conditions involved in the manufacture of a manure from the London sewage by the two processes above mentioned, we come to the conclusion that they offer no chance of success as commercial speculations.

We have been led to this conclusion by considerations, among which the following are the more important:

(1.) In estimating the commercial prospects of a process, it is safer to rely upon the results obtained in a manufacturing operation, than on those furnished by experiments on a smaller scale. Now, analysis shows that the value of the article manufactured at the works at Leicester, where the liming process is used, is less than one-half of the value which experiment assigns to our manure obtained on a small scale.

(2.) In calculating the probable expense of manufacturing the sewage manure, the interest of the capital required for the erection of works, the actual cost of producing and the commercial expenditure, we have had but insufficient data, and they have therefore probably been estimated below what would be found to be the case in practice; all these circumstances prove that the profit resulting from the manufacture of sewage manure would be reduced to a very small amount.

3. The nature of the manure manufactured by either of these processes, its great bulk, containing as it does but a very small quantity of valuable constituents in a very large mass of inert matter, increases the cost of carriage and spreading, when compared with that of guano, to such an extent as to limit its application to a very small area. With reference to the liming process, for instance, taking the value of the Leicester bricks as representing the average value of the lime manure, and starting from the calculation of the manufacturing expenses chiefly furnished by the estimate of Mr. Wicksteed, the patentee, we find that the profit on a ton of lime-manure sold at the works would be 5s. 3d., whilst at a distance of only two miles from the works it could not realise more than 2s. 3d. profit, and when transported to a distance of five miles, the manure would have to be sold at a loss.

IV.—Utilisation with Sewage in a Liquid State. *Irrigation with Sewage.*

In order fully to appreciate the proposal which has been made of using sewage for the purpose of irrigation (an application, the beneficial and advantageous results of which are established beyond a doubt), it is necessary to recollect that 100 tons of London sewage contain 2s. 2½d. worth of valuable constituents in the solid, and 15s. 4½d. worth in the liquid form; and that in order to supply a meadow with valuable matters corresponding in quantity to those contained in one ton of guano, it is necessary to irrigate with 1,250 tons, or 310,000 gallons of sewage.

A general consideration of the question points out the great expense which necessarily must attend a regular distribution in this way of the enormous quantities of sewage produced annually by the metropolis; nevertheless, there are too many elements (engineering and agricultural) entering into the question to enable us, as chemists, to pronounce any very decided opinion as to whether the application of the sewage of the metropolis in this way would, or would not, be a remunerative commercial speculation; but, so far as we have been enabled to ascertain, we believe that the proposal of using it in this way is the *one which appears to us* to be the *most promising*; and, we would even say, the *only one that has any chance of success as a commercial scheme*; and we would therefore suggest that, in devising means for removing the metropolitan sewage, they should not exclude the possibility of giving this method the trial which it merits.

V.—Consideration of the Manufacture of Sewage Manure from a Sanitary Point of View.

The several processes submitted to us for *deodorising and consolidating sewage into a manure* (viz., (A.) By means of lime; (B.) By the use of Stothert and Gotto's mixture; (C. 1.) By filtration through charcoal; and, (C. 2.) By shaking with charcoal), *all fulfil, to a certain extent, the office for which they were proposed.* At the same time, it is found that these several processes *leave a large quantity of putrescible organic matter in solution, which, especially in hot weather, is apt to undergo decomposition, and to give rise to the generation of effluvia of the most offensive and dangerous character*; and we believe that the *erection of works in the immediate neighbourhood of the metropolis*, for the deodorisation of the London sewage, *might prove very prejudicial* to the *health and comfort* of the inhabitants of London; and that, in the event of the establishment of such works, *the fluid run off from the sewage deposit, if discharged into the Thames in the vicinity of London, might very seriously affect the river.*

FINANCIAL RESULT OF THE ART TREASURES EXHIBITION.

At a meeting of the guarantee subscribers, the Executive Committee of the Exhibition made their preliminary report on the financial results, by which it appears that the Exhibition was kept open during 142 days, of which two—on the occasion of the opening and the public visit of her Majesty the Queen—were reserved for the holders of two-guinea season tickets, and on the remainder the public were admitted by payment at the doors.

The total number of paying visitors reached 1,053,538. The season ticket holders of both classes availed themselves of their privileges to enjoy 282,377 visits, making the total number of visitors 1,335,915.

Up to the public close of the Exhibition, on the 17th of October, the cash receipts from all sources standing to the credit of the committee may be stated at £98,500. The total expenditure up to the same period, and the further liabilities which are definitely known to the committee, such as cost of police to the end of November, insurance of all kinds, rents, &c., amount to £99,500. The still further outlay to be incurred, includes all the expenses of returning the contributions to their respective owners.

It will be seen at once that it would be impossible at the present moment to give anything more than this approximate statement. To meet this excess of expenditure over the cash receipts, there remain the Exhibition building and its fittings.

Some time since the committee announced, by advertisement, that they were prepared to receive offers for the building as it stands. This advertisement has not called forth at present a single reply.

It is intended, when the building is sold, and the expected surplus realised, that the guarantee subscribers be again called together to decide upon the appropriation of the surplus, in such a manner as may worthily commemorate the Art Treasures Exhibition of 1857. The Chairman of the Executive Committee stated, in reference to the Soulages Collection, that the terms on which he and his colleagues held possession of it were these:—that, until the expiration of 28 days after the close of the Exhibition of Art Treasures, the corporation of Manchester, or any other person desirous to purchase the collection entire for purposes of permanent public exhibition and instruction in Manchester, and who will engage to devote it to such and no other purpose, shall have the pre-emption for the sum of £14,175. And in the event of such pre-emption not being claimed within 28 days, and the contract of purchase not being signed, the President of the Committee of her Majesty's Privy Council of Education shall then have the option of purchasing the collection entire for public purposes at the like sum during the next 28 days. If not then disposed of, then he and the Manchester managers had the further right to purchase it between them in equal portions at any time during 14 days. If the whole or only half of it be purchased within that time, then the collection or remaining half should be sold by auction in London not later than June, 1858. They were bound by the 15th of November to offer the collection to government, and it was desirable that in the mean time the public of Manchester should have a further opportunity of inspecting it. An arrangement had been made with the Council of the Royal Institution, by which two rooms would be set apart for the exhibition of the collection, which would shortly be displayed there.

NATURAL AND INDUSTRIAL PRODUCTS OF CALIFORNIA.

The *Times* correspondent at San Francisco, in his letter dated 20th September, says:—

"The citizens of San Francisco have got up a Mechanics' Fair—a sort of Crystal Palace in miniature—which displays an array of articles in the departments of the material arts and mechanics, highly creditable to the skill and industry of the working classes, and to the spirit and enterprise of the people of the State generally.

"Specimens of native wines, brandies, and other spirituous drinks; medicines extracted from native herbs; sugar from beet-root, grown in a neighbouring valley; perfumeries distilled from native flowers; soaps; brushes from Californian bristles; brooms from native reeds; paper from bulrushes; quartz-crushing machines, in variety enough to enable the most extravagant gold-hunter to realise his dreams of wealth; billiard tables of great beauty and accuracy, said to be equal to 'Thurston's best;' pianos of good tone, as is professed by their makers, and of exquisite workmanship and tasteful form, as is apparent to all; furniture made in San Francisco, equal in material, design, and finish to the best modern workmanship of London and Paris, and (what is of more consequence to buyers) offered at prices cheaper than good rosewood articles can be imported; agricultural implements, which from their variety and novelty of design, should make the very desert produce abundance,—these are a few of the vast number of articles of utility in the fair. As for the cereals, seeds, fruits, and vegetables, the first two are so prolific, and the latter two of so prodigious a size, that if I were to give their products and dimensions in weight and measurement, my statement would be doubted. It is only a rich, deep, virgin soil, assisted by a most genial climate, that produces such monstrous vegetables and such gigantic corn-stalks and seeds as are to be seen here, and I know of no other country which possesses a soil and climate equal to ours. The specimens of minerals are very numerous, very curious, and many of them very beautiful and valuable.

"The exhibition of so large and varied a collection of native articles which enter into the general consumption of the country, got together on a short notice, in a State yet in infancy, gives rise to important reflections.

"Hitherto we have been dependent upon foreign countries for our supplies of every kind. What we ate, drank, and wore we were obliged to import, and to pay fabulous prices for. Living on a desert sandy beach in 1849, prices were regulated by caprice, and ordinary comforts were only obtained by a waste of money. Even our staple product, gold, which we were accustomed to look upon as the means of supplying all human wants, did not serve us, for we were obliged to export it, to receive back coin from the United States and from the countries of the old world, to serve us as a circulating medium, for, after a year or two's use, gold-dust was found too inconvenient to be continued in that capacity. How great a change the few short years of our existence as a nation have produced, was striking illustrated by the secretary in his address at the opening of the fair.

"I should like to cull a few facts from this very interesting, practical, and sensible document, written by a carpenter of San Fransisco—a composition which, I fear, few of his class in life in any other country could produce, and which I take to be a striking exemplification of the benefits of a system of universal education, regardless of creed, established among a people.

"Passing by his agricultural statistics simply with the remark that while, in 1850, we had to import the food necessary to support life, we now export grain and flour to an extent that saves the country 10,000,000 dols., to 12,000,000 dols. at the low prices now obtained, but which, at the high rates which ruled at the periods when we were dependent upon foreign supplies, would have cost 20,000,000 dols. a-year,—I will notice a few of the facts which show the progress of native manufactures:—Sugars and syrups, which were imported to the value of several millions of dollars, are now manufactured in the country, and the facilities of obtaining the raw sugars from the coasts and islands of the Pacific, China, and other Eastern countries, are such as to enable the sugar refiners to undersell the importers of refined sugars; while the successful experiments which have lately been made in the culture of the sugar-cane in California justify the expectation that the soil of this State will produce sufficient of the raw material to supply the consumption of the country. The rope heretofore consumed has cost from 300,000 dols. to 400,000 dols. annually. A cordage factory now supplies our wants in that line at cheaper rates than it can be imported, our facilities of obtaining the raw material from Manilla enabling the manufacturers here to undersell the Atlantic and European importer. There are 30 tanneries in operation, making leather used for harness, mill straps, and personal use, although a vast quantity of hides are exported to the Atlantic States. Fourteen foundries and a great many machine shops supply the country with steam engines, boilers, quartz-crushing machines, and a variety of iron and steel work of good quality and construction at comparatively low prices. Steamboats and sailing vessels are continually being built for the inland navigation and coast trade. Agricultural implements and carriages of all sorts are made; and, to descend to small but necessary articles, fancy soaps and perfumes, which till last year took 600,000 dols. a-year away to pay to the foreign manufacturer, are now made on the spot, and promise to render us independent of importation.

"Lumber, which we formerly received from the Eastern States and Chili, is now largely exported, besides supplying home wants, and at this moment sleepers to the amount of 3,000,000 of feet are being sent to Chili for the Valparaiso and Santiago railroad.

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The reduction of imports accounts for the falling off in the export of gold, which has ignorantly been attributed to the exhaustion of the mines—a fallacy which ill-informed writers abroad had fallen into.

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On the 31st ult. the first government mail arrived from the Atlantic across the continent to San Diego in the southern portion of California. The trip was not quite successful, owing to the knocking up of the animals. It took 34 days to make the trip. When the arrangements are perfected it will be accomplished in 25 days. The mail riders report a large emigration to be on the way by this, the southern, route to California. The American Government is digging wells in the desert and improving the road for the benefit of the western emigrants, who have so great an aversion to a sea voyage that they prefer spending a year on the road to coming by way of Panama in five or six weeks' time. We look for a great emigration across the plains this year.

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"Mining operations, both in quartz and in placer digging, are carried on with as much zeal as ever. Now that the water has failed in such districts as are not artificially supplied by canals, much work is being done in the beds of rivers while the streams are low, and in many instances the streams have been turned out of their natural channels so as to lay bare the beds, which are then dug; and in many instances these prove very rich in deposits of coarse gold. Artificial canals are much on the increase—still much wanted, and are good paying concerns when well and honestly managed, but rather hazardous as investments to non-residents."

FREE LIBRARIES.

Free Libraries have been established in the following places:—

1. Aberdeen.
2. Birkenhead.
3. Bolton.
4. Cambridge.
5. Hertford.
6. Kidderminster.
7. Leamington.
8. Lichfield.
9. Liverpool.
10. Lyme Regis.
11. Manchester.
12. Newcastle-upon-Tyne.
13. Norwich.
14. Oxford.
15. Preston.
16. St. Helen's.
17. Salford.
18. Sheffield.
19. Warrington.
20. Westminster.
21. Winchester.

22. The following places have rejected the proposition to establish Free Libraries, viz.:—

Birmingham.
Cheltenham.
Exeter.
Haslingden.
Hull.
Islington (London).
London (City).
St. Marylebone (London).

SOUTH KENSINGTON MUSEUM.

During the week ending 31st October, 1857, the visitors have been as follows:—On Monday, Tuesday, and Saturday (free days), 3,808; on Monday and Tuesday (free evenings), 5,042. On the three students' days (admission to the public 6d.), 579. One students' evening, Wednesday, 206. Total, 9,635.

Home Correspondence.

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ARSENIC IN PAPER-HANGINGS.

Sir,—The remarks of Dr. Taylor, quoted in a recent number of the *Journal*, reminded me of a circumstance which occurred some months ago.

A young man who was engaged in papering my house looking very ill one day, I inquired the cause, and was told that it was in consequence of putting up "the green papers." He said that whenever he put up papers of that colour, his nose and eyes became inflamed; his nose often bled profusely, and towards the close of his day's work he frequently became so sick and giddy that he had great difficulty in standing on his ladder. The night before this conversation, he had been obliged to ask one of his friends to help him home, not being able to walk alone. In one or two cases previously, he had been obliged to give up work for two or three days.

The man was of course poisoned by the arsenic in the colouring matter. His fellow-workmen are affected by the same symptoms.

I sincerely hope that the skill of our chemists will discover some safer basis for green colouring, and that the use of this deadly poison will be prohibited.

I am, &c.,
WILLIAM BLAKE, M.A.

Grammar School, Penrith, Oct. 28, 1857.

STUDY OF PHYSIOLOGY.

Sir,—On looking over in the *Journal* the reports on the Society's last Examinations, I have been sorry to see how little attention is paid to the study of human physiology. The Society most properly introduces the subject into its programme, but, if I mistake not, one solitary candidate only presented himself to the Examiners. This is not as it should be, and I am anxious to call the attention of the Council to the importance of some steps being taken to promote a more general study of this subject. It is one which is essentially practical, and bears directly upon the affairs of every-day life. All are interested in it, whatever be their rank, though I fear that the neglect of this study is not confined to what are commonly termed the uneducated classes. At the meeting of the Association for the Promotion of Social Science, held lately at Birmingham, it was well observed during the sitting of the Public Health Section, that until the study of these matters is made more general, it is vain to hope for any satisfactory progress in those measures of sanitary reform which the labours and researches of enlightened men are developing for our benefit. It is not the poor alone who are insensible to their importance, our legislators are scarcely more enlightened. So long ago as 1853 the advantage of making these things a part of the education of the young was pointed out in a statement signed by upwards of sixty leading medical men and professors in the medical schools of London. The statement runs thus:—

Medical Opinion on the Importance of Teaching Physiology and the Laws of Health in Common Schools.

"Our opinion having been requested as to the advantage of making the elements of human physiology, or a general knowledge of the laws of health, a part of the education of youth, we the undersigned have no hesitation in giving it strongly in the affirmative. We are satisfied that much of the sickness from which the working classes at present suffer might be avoided; and we know that the best-directed efforts to benefit them by medical treatment are often greatly impeded, and sometimes entirely frustrated, by their ignorance and their neglect of the conditions upon which health necessarily depends. We are therefore of opinion, that it would greatly tend to prevent sickness and to promote soundness of body and mind were the elements of physiology, in its application to the preservation of health, made a part of general education; and we are convinced that such instruction may be rendered most interesting to the young, and may be communicated to them with the utmost facility and propriety in the ordinary schools, by properly instructed schoolmasters."

It was, I believe, addressed to the Committee on Education of the Privy Council, but I am not aware that any steps were taken in consequence.

In America the subject has already been taken up. The following is an extract from the general laws relating to public instruction, passed by the Legislature of Massachusetts, in the year 1850:—

"Chapter 229, entitled "An Act requiring physiology and Hygiene to be taught in the Public Schools."

"SECT. 1. Physiology and Hygiene shall hereafter be taught in all the Public Schools of this Commonwealth, in all cases in which the School Committee shall deem it expedient.

"SECT. 2. All School Teachers shall hereafter be examined in their knowledge of the Elementary Principles of Physiology and Hygiene, and their ability to give instruction in the same.

"SECT. 3. This Act shall take effect on and after the first day of October, One thousand eight hundred and fifty-one." (*April* 24, 1850.)

It appears to some to be peculiarly the province of the Society of Arts, whilst promoting education among the students of Mechanics' Institutions, to endeavour to give a practical turn to their studies, and to foster not merely a love of abstract science, but a knowlege of those applications of it which may be found valuable to every one in his daily avocations, and may promote his health, comfort, and material well-being.

I am, &c.,
MATHEMATICUS.

Proceedings of Institutions.

BRADFORD, WILTS.—In the report of the Literary Institution, presented to the Fifth Annual General Meeting, held at the Town-hall, on Tuesday, the 6th of Oct., when W. Gee, Esq., occupied the chair, the Committee congratulate the members upon the progress it has made during the past year, in many respects the most important in the history of the Society, both as regards the increase of subscriptions, and the more general feeling of interest excited among the inhabitants of the town in favour of its success. The number of subscribing members during the past year, ending Aug. 31, is 152; the total revenue from subscriptions and donations, amounts to £86 13s. 3d., of which £71 is from annual subscribers, £7 18s. 9d. from half-yearly, quarterly, and monthly subscribers; and £7 14s. 6d. from donations. The Committee, in acknowledging the obligations of the Society for the valuable and instructive lectures delivered in the Town-hall during the past winter, record, with pleasure, the renewed interest of the members in this department, indicated by their largely increased attendance. The library has been increased by donations of books fromvarious members, and now numbers 682 volumes. The circulation of books amounts to 1,910 volumes.

HANLEY, STAFFORDSHIRE.—W. H. Russell, Esq., LL.D., late the Special Correspondent of the *Times* in the Crimea, delivered,—in connection with the Pottery Mechanics' Institution,—his Personal Narrative of the late War with Russia, at the Town-hall, Hanley, on the evening of Thursday, Oct. 29. The Mayor, John Ridgway, Esq., presided, and the room was well filled. At the conclusion of the address, a vote of thanks to Mr. Russell was carried by acclamation.

LOUGHBOROUGH.—The ninth annual report of the Literary and Philosophical Society, states that during the past year 18 members have joined the Society, the present number being 159. Some years ago the Society held an interesting conversazione, at which the attractions of social intercourse were enhanced by the exhibition of a few antiquities and articles of *vertu*. Early last session the committee proposed a repetition of this entertainment; but the idea expanded, under discussion, into a more ambitious design, resulting in an exhibition. The complete success of this undertaking, must be attributed in a great measure to the unreserved liberality with which it was generally met. In consequence, there were but few objects of interest in the district of which the exhibition did not become the temporary repository. The committee especially mention the prompt encouragement and extensive contributions of the Dowager Lady Sitwell, and of C. W. Packe, Esq., M.P., the President of the Society. The thanks of the Society are due to the Leicester Museum, the Society of Arts, and to the rest of the contributors. The exhibition was opened by a soirée, which proved so successful, that a second and a third were held. At these meetings, short addresses on various subjects were delivered by J. F. Hollings, Esq., T. R. Potter, Esq., Revs. H. Fearon, T. S. Millington, T. White, W. Bailey, T. A. Smith, Dr. Eddowes, Messrs. B. W. Brown, C. F. Powell, Beattie, Hughes, Spanton, and other gentlemen. Thanks are due to Mr. Cramer for his able musical assistance. The financial results have been most satisfactory. After paying all expenses, a surplus was left of about £25. The exhibition included paintings by the old masters, original portraits, the works of modern painters, as well as of amateurs and native artists; drawings in water colours, and pen and ink; chromo-lithographs, photographs and specimens of photogalvanography, and nature printing; engravings, lithographs, statuary, bronzes, and articles of vertu, as well as flowers in wax and shells. There were various objects illustrating the sciences of geology, botany, and natural history; philosophical instruments, and working models of machinery. In the industrial department, were included local and other manufactures; numerous antiquities, relics of the late war, and miscellaneous curiosities were also shown. The committee congratulate the inhabitants of the district, on the riches of art and science congregated around them, and on the manifest interest and delight felt by all classes in such objects. They also refer with great pleasure to the large number of articles sent to the exhibition, which were the productions of native talent and native industry. To foster and develope the local resources of the town was one of the main purposes of the exhibition; and they cannot but feel how decided has been its success in this particular. The following lectures have been delivered since the last report. Dr. Bernays, "The Nature and Properties of Common Salt;" Mr. W. Williamson, "Fire, its History and Theology, the Salamander;" Rev. T. C. Holland, "The Geology, Mineralogy, and Botany of the Neighbourhood of Loughborough;" Rev. T. White, M.A., "Festus—A Poem, by P. J. Bailey;" Geo. Dawson, Esq., M.A., "George Fox;" Dr. G. Kinkel, "Mediæval Art;" Rev. W. Bailey, "British India;" Mr. J. Beattie, "Light and the Chemistry of Photography;" E. J. Lowe, Esq., F.R.A.S., F.G.S., F.L.S., M.B.M.S., &c., "The Interest attached to the Study of Natural History;" Rev. W. Axford, "Scenes in a Gipsy Camp." On Tuesday, the 20th October, a meeting of the Society was held in the Town-hall. The Rev. T. White, M.A., read a paper on "The Influence of Christianity on the Law of Nations." He was followed by Mr. Spanton, who spoke upon the connexion of the Society with the Society of Arts, and on the defections of the present system of education. The Rev. T. A. Smith, M.A., occupied the chair.

MEETINGS FOR THE ENSUING WEEK.

TUES. Syro-Egyptian, 7½. "On the Locality of the Pyramids of Ghiza, illustrated by the panoramic view taken out of the great Prussian Work," by Messrs. Sharpe and Bonomi.
Civil Engineers, 8. Mr. Alexander Wright, Assoc. Inst. C.E., "On Lighting Mines by Gas."
Med. and Chirurg., 8½.
Zoological, 9.
WED. Microscopical, 8.
FRI. Astronomical, 8.
SAT. Medical, 8.

PATENT LAW AMENDMENT ACT.

APPLICATIONS FOR PATENTS AND PROTECTION ALLOWED.

[*From Gazette, October* 30.]

Dated 1*st September*, 1857.

2288. John George Taylor, Glasgow—Improvements in the construction and alteration of doors, shutters, blinds, and other closures to buildings and erections so as to allow of their illumination, which improvements are also applicable to omnibuses and other vehicles, and to clock-dials, lamps, and postal pillars.

Dated 3*rd October*, 1857.

2536. John Dyson, Edwin Wilkinson Shirt, and Henry Shirt, Tinsley Works, near Sheffield—Improved straps or driving bands for machinery.

Dated 12*th October*, 1857.

2610. Prodromos B. Kyishogloo, Constantinople—Improvements in obtaining and applying motive power.

Dated 13*th October*, 1857.

2612. William Brookes, 73, Chancery-lane—Improvements in combing wool and other fibres. (A communication.)

2614. Charles Coffey Alger, Newburg, county of Orange, U.S.—An improved furnace for smelting iron.

2615. Edward Deane, Arthur-street, London-bridge—An improved weapon to be used either as a sword or as a pistol, or both.

2616. Thomas Bell, Plaistow, Essex—Improvements in the manufacture of alkaline salts.

2618. Meliton Martin, Madrid—Improved apparatus for retarding and stopping railway carriages.

2620. James Yates, Little Bolton, Lancashire—Improvements in machinery or apparatus used in preparing and spinning fibrous materials.

Dated 14*th October*, 1857.

2624. Adolphe Barthélemy Ellena, Paris—A new mechanical means of rocking cradles.

2626. John Henry Johnson, 47, Lincoln's-inn-fields—Improvements in producing figured paper to be used in teaching writing and drawing. (A communication.)

2628. Frederick Hale Holmes, Blackwall—Improvements in magneto-electric machines.

2630. Thomas Restell, New Kent-road—Improvements in breech-loading fire arms, in projectiles, and in cartridges for breech-loading arms.

2632. John Croft Plomley, Maidstone—An improved method of drying malt, hops, and other produce.

Dated 15*th October*, 1857.

2634. Edward Wilkins, Walworth—Improvements in frames for horticultural and vegetative purposes.

2635. William Ashby Rooke, New Brentford—Using and employing dextrine in the making and sizing of paper.

2636. Charles Reeves, Birmingham—An improvement or improvements in the manufacture of swords, matchets, and knives.

2638. Frederick Priestley, Berners-street, Oxford-street—Improvements in signal instruments or apparatus for making or transmitting electric telegraphic signals.

2639. Thomas Richardson, Newcastle-upon-Tyne, and Manning Prentice, Stowmarket—Improvements in the manufacture of salts and preparations of phosphoric acid.

2640. William Brown Hopper, Camberwell—Improvements in floating docks.

2642. Joseph Gibbs, Abingdon-street, Westminster—A method of treating phormium tenax, in order to render it fit for the manufacture of pulp.

2643. Paul Heilmann, Mulhouse-town, France—Certain improvements in spinning silk, cotton, wool, and other fibrous substances.

2644. Charles Walker, New Lanark, N.B.—Improvements in atmospheric railways.

2645. Charles Walker, New Lanark, N.B.—Improvements in the manufacture of manure from sewerage or drainage matters.

2646. George Scarr and James Pollard, Burnley, Lancashire—Certain improvements in power looms for weaving.

2647. Richard Wright, Brighton—Improvements in the application of certain fluid and other matters to heating purposes, and in apparatus for the same.

Dated 16*th October*, 1857.

2649. John Wright, New George-street, Sheffield—Improvements in preparing or treating strips of steel for hardening and tempering.

2650. Ward Holroyd, Halifax, and Samuel Smith, Shipley, near Bradford, Yorkshire—Improvements in looms for weaving.

2651. Julian Bernard, the Albany, Piccadilly—Certain improvements in the manufacture or production of boots and shoes, or other coverings for the feet, and in machinery, apparatus, and materials to be employed in such manufacture.

2652. Lucien Arbel, Rive de Gier, France—Certain improvements in manufacturing wheels for carriages on railways.

2653. Richard Archibald Brooman, 166, Fleet-street—An apparatus for scoring games and points at games. (A communication.)

2654. James Chadwick, Castleton Print Works, near Rochdale—Improvements in rollers or cylinders for printing or staining the surfaces of woven fabrics, yarns, paper, and other materials.

Dated 17*th October*, 1857.

2655. Thomas Holt, Little Bolton, Lancashire—Improvements in looms.

2656. Richard John Badge, Newton Heath, near Manchester—An improved mode or method of securing railway chairs to the sleepers.

2657. Joseph Bentley, Liverpool—Improvements in fire arms.

2658. Edward Humphrys, Deptford—Improvements in engines worked by steam or vapour.

2659. James Eastwood, Derby—An improvement in working the valves of steam hammers by a direct self-acting motion.

2660. Richard Archibald Brooman, 166, Fleet-street—Improvements in forming the joints of pipes, for conveying water, gas, and other fluids. (A communication.)

2661. Thomas Massey, 4, Birchin-lane, and Thomas Savage, 19, Soley-terrace, Pentonville—Improvements in sounding machines.

2662. William Osborne, 5, Bow Churchyard, Cheapside—Improvements in ladies' petticoats, under skirts, and dresses.

2663. Leon Lewenberg, New York—Improvements in railway alarms and marine alarms or fog signals.

Dated 19*th October*, 1857.

2665. John James Sieber, 5, Baring-street, New North-road—Improvements in power looms. (A communication.)

2667. Victor Péan, 39, Rue de l'Echiquier, Paris—Improvements in protecting the walls, ceilings, wainscots, and other parts of buildings from humidity.

2669. Richard Archibald Brooman, 166, Fleet-street—Improvements in produced figured fabrics in which the design is applied by printing. (A communication.)

2671. Michael Henry, 77, Fleet-street—Improved machinery for unmaking rope or cordage. (A communication.)

2673. Edward Cockey, Henry Cockey, and Francis Christopher Cockey, Frome Iron Foundry, Somerset—Improvements in regulating the flow of fluids.

2675. William Bentham, Halifax, Yorkshire—Improvements in harmoniums and other similar reed instruments.

2677. David Patridge, Tavistock-place, Plumstead-common, Woolwich—Improvements in shaft bearings.

Dated 20*th October*, 1857.

2679. Edward Briggs, Castleton Mills, near Rochdale—An improved manufacture of printed piled fabric.

2681. George Horatio Smith, Norfolk-street, Strand—An improved governor or regulator for steam and other engines.

2683. John Henry Johnson, 47, Lincoln's-inn-fields—Improvements in Jacquard machines, and in the cards employed therein. (A communication.)

WEEKLY LIST OF PATENTS SEALED.

October 29th.

1238. Henry Levy.
1241. Joseph Davy and William Bentley.
1256. John Leslie.
1258. John Thomas Way.
1281. Matthew Semple.
1493. Robert Low and William Press.
1639. James Robertson.
1703. Thomas Ward.
1795. John Bourne.
1280. Henry Gilbee.
1831. Joseph Nickless.
1872. William Munt.
1880. Frederick Bousfield.
1902. Nicholas Marshall Cummins.
1948. William Edward Newton.
1989. Augustus Dacre Lacy, and William Collett Homersham.
2249. James Ronald.

November 3rd.

1265. John Talbot Pitman.
1270. William Wilkins.
1274. Johann Philippe Becker.
1275. George Kennedy Geyelin.
1280. Henry Hogarth.
1288. Herbert Mackworth.
1294. Charles Tilston Bright and Charles De Bergue.
1296. Louis Charles Dolleans.
1308. George Heppell.
1318. James John Myers.
1326. Samuel Hallett.
1360. William Ashby.
1372. William Hartley King.
1414. Abel Foulkes.
1476. John Earnshaw, junr.
1498. Virginie Bacqueville-Pieters.
1530. John James and William Daykin Grimshaw.

PATENTS ON WHICH THE STAMP DUTY OF £50 HAS BEEN PAID.

October 26th.

2289. Auguste Edouard Loradoux Bellford.
2301. Rd. Archibald Brooman.

October 29th.

2305. John Coope Haddan.
2308. Robert Stirling Newall.
2373. Paul Pretsch.

October 30th.

2302. Oliver Maggs.
2310. Thos. Frederick Tyerman.

October 31st.

2320. James and William Bradshaw.

WEEKLY LIST OF DESIGNS FOR ARTICLES OF UTILITY REGISTERED.

No. in the Register.	Date of Registration.	Title.	Proprietors' Name.	Address.
4029	Nov. 4.	A Stud or Fastening for Buttons, Brooches, Studs, and other similar articles	Claude Louis Alexandre	Clerkenwell.

Journal of the Society of Arts.

FRIDAY, NOVEMBER 13, 1857.

MEETING OF COUNCIL.

The following Institutions have been taken into Union since the last announcement:—

445. Dartmouth, Literary Institution.
446. Holbeck (near Leeds), Church Institute.

NOTICE TO MEMBERS.

The One-Hundred-and-Fourth Session of the Society, will commence on Wednesday, the 18th inst.

The Chair will be taken at Eight o'clock on the following Wednesday evenings:—

1857.—November	...	...	18	25	...
,, December	2	9	16	...	...
1858.—January	...	13	20	27	...
,, February	3	10	17	24	...
,, March ...	3	10	17	24	...
,, April	7	14	21	28	...
,, May	5	12	19	26	...
,, June	...	...	...	...	30*

For the Meetings previous to Christmas, the following arrangements have been made:—

November 18.—Mr. C. Wentworth Dilke, *Chairman of Council.* Introductory Address on the Opening of the One-Hundred-and-Fourth Session.

> *** On this evening the Medals which were awarded by the Council for Papers read at the Weekly Evening Meetings during the last Session, and for articles submitted to the Society's Committees, will be distributed.

November 25.—Dr. Forbes Watson. "On the Food Grains of India."

December 2.—Mr. Apsley Pellatt. "On the Comparative Heating Powers of Coal and Coke, in reference to Economy in Fuel and the Smoke Nuisance."

December 9.—Mr. S. Sidney. "On the Progress made of Late Years in the Manufacture of Agricultural Machines and Implements."

December 16.—Mr. John Underwood. "On the History and Chemistry of Writing, Printing, and Copying Letters, and a new plan of taking Copies of Written and Printed Documents, Maps, Charts, Plans, and Drawings."

The subjects to be discussed at the Wednesday Evening Meetings will be regularly advertised in the Journal, some time in advance. By this means it is hoped that the largest amount of information that is possible may be brought together in the necessarily limited time at the disposal of the Meeting.

It is exceedingly desirable that Members should aid the Council in procuring Communications to be read at the Evening Meetings, or for publication in the Journal. Our Colonies, their Wants and their Products—Improvements in our Home Industries—Economical adaptations of machinery or processes to Manufactures—The production of novel or improved articles of Commerce—The employment of new substances, or new methods of treating those hitherto used in the Arts and Manufactures, are some among the many subjects to which attention may be directed.

SOME CHEMICAL FACTS RESPECTING THE ATMOSPHERE OF DWELLING HOUSES.

Dr. Roscoe, in a communication to the Chemical Society,* has given the results of an investigation in relation to this subject, carried on under a commission appointed for the purpose by the General Board of Health.

The air of a closed inhabited space becomes unfit for respiration long before all the oxyen has disappeared, and the presence of mere traces of the products of combustion produces an unhealthy atmosphere, even when almost the normal quantity of oxygen is present. The impurities introduced into the air are the real cause of unhealthiness.

The conditions of deterioration which render the supply of fresh air necessary to living animals inhabiting closed spaces, are—

1. The presence of an excessive quantity of oxides of carbon and other poisonous gases.
2. The presence of either too large or too small a quantity of aqueous vapour dissolved in the air.
3. The presence of organic putrescent bodies, effluvia, proceeding from decomposing animal or vegetable matter.
4. Inconvenient elevation of temperature, arising from the heat of combustion.

The existence of any one of these four sources of deterioration in the air, in which animals dwell for any length of time, is injurious to their health. In general, however, these four conditions of insalubrity occur together, and an efficient system of ventilation must, therefore, 1st, free the air from the excess of the products of the oxidation of carbon; 2ndly, adjust the proper equilibrium between the air and the dissolved aqueous vapour; 3rdly, carry off completely all putrescent organic matter disseminated through the air; and 4thly, establish an agreeable mean temperature.

The mean of the experiments by Scharling, Vierordt, and Huchinson, gives 19.8 litres (1208 cubic inches) as representing the maximum quantity of carbonic acid evolved by an individual per hour. There are no direct experimental facts on which to ascertain how small a quantity of the oxide of carbon affects the health of individuals. One per cent. of carbonic acid is admitted to be injurious, and Leblanc and Péclet affirm the same of 0.5 per cent., whilst Reid and Arnott give a much lower limit, and Dr. Roscoe considers it, in the present state of knowledge, "premature to say that the smallest increase above the normal amount (4 in 10,000) is not productive of harm."

Carbonic oxide is a more violent poison than carbonic acid; one per cent. of the former is immediately fatal. The average amount of aqueous vapour in the atmosphere may be taken at about 75 per cent. of the saturating quantity.

The third cause of deterioration in an inhabited confined atmosphere, viz., the presence of organic putrescent matters, animal effluvia, is one which for the present cannot be estimated chemically, and therefore as,

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* The Annual General Meeting; the chair will be taken at 4 o'clock. No visitors are admitted to this meeting.

* *Journal of the Chemical Society*, Vol. x., p. 251.

cœteris paribus, the amount of carbonic acid evolved from oxidation of the animal body must be proportional to the quantity of decomposing organic matter, for the present the carbonic acid must be taken as representing deterioration both from respiration and from putrescent exhalation.

Writers differ much as to the quantity of air required for healthy respiration, Péclet gives 5 cubic feet per minute as necessary for each man; Vierordt 2½; Dr. Reid 10; Dr. Arnott 20; whilst Dr. Roscoe considers, from experiments in schools and barracks, that 10 feet per minute is insufficient, and that at least 20 feet are necessary to remove completely the organic putrescent matter, at least in the soldiers' sleeping-rooms.

The present incomplete state of the whole subject of ventilation, depends in a great measure on the want of precise information on two fundamental points. The first of these has been considered, viz., when is, and when is not, a closed inhabited space unhealthy? To this question no definite answer can be given. The second point, upon which knowledge is equally defective, relates to the amount of exchange of air which is obtained from accidental sources under all possible conditions. Until it is known exactly when an atmosphere is unhealthy, and it can be determined how much fresh air enters, and deteriorated air issues from the windows, doors, and chimneys, under given circumstances, it cannot be expected that the subject of ventilation should assume a definite form.

Experiments were made by Dr. Roscoe to determine the second of these points.

A quantity of carbonic acid was evolved in a room of 2,500 cubic feet capacity, containing no fire and a closed flue, and all doors (four) and windows (two) were shut. The carbonic acid contained in the inclosed air was then determined at consecutive half hours.

The result showed that the carbonic acid diminishes in half an hour from 0.7 to 0.3 per cent. of the total volume of air, although all direct ventilation was checked. After the first half-hour the amount of carbonic acid remained constant, possibly from the continued respiration of two persons in the confined atmosphere. The exchange of carbonic acid through close windows, doors, and walls appears from this experiment to be very great.

Experiments were made to ascertain the quantity of carbonic acid which diffuses through bricks, and the result showed a total loss in two hours of 3.25 per cent. on a total of 16 per cent. of carbonic acid gas; that is, when a closed space contained 16 per cent. of carbonic acid, more than 3 per cent. escaped through the solid brick. Hence the beneficial action of our brick and mortar walls is therefore not merely confined to taking up or giving off moisture to the air, for they are eminently hygroscopic, but an actual and very large diffusive interchange goes on within the pores of the brick and mortar, so that our walls become a most important aid to ventilation. Of course the kind of surface covering which the walls possess, will materially influence the amount of diffusion which takes place through them, but the well-known unhealthiness of iron or new and damp houses, may probably, to some extent, be accounted for by the absence of all diffusive interchange through the wet walls.

A series of experiments was made for the purpose of determining the quantity of carbonic acid and aqueous vapour, and in one case the amount of carbonic oxide and hydro carbon, present in the air. Dr. Roscoe thus describes the means and the calculations employed:—

"By means of a large aspirator, a known volume of air V, under a known pressure P, and at a known temperature, t, can be drawn over a system of weighed tubes, alternately filled with pumice-stone steeped in sulphuric acid and potash. The two tubes furthest from the aspirator contained sulphuric acid, for the purpose of drying the air, the next two tubes contained hydrate of potash, in a soft spongy mass, to absorb the carbonic acid, and the next two tubes contained sulphuric acid, to retain any moisture taken from the potash. The volume of dry air V_1 at 0° and 0·76, is found from the following equation, in which p signifies the tension of aqueous vapours at t° C.

$$V_1 = \frac{V\,(P - p)}{(1 + 0{\cdot}00366t)\;0{\cdot}76}$$

The volume of carbonic acid at 0° C, and 0·76 met. is found in cubic centimetres by multiplying the weight of carbonic acid found in grammes by 503·27, the volume in cub. cent. of 1 gramme of carbonic acid at the normal temperature and barometric pressure."

To test the accuracy of the method, a determination was made of the carbonic acid contained in the free air of London on a windy day, February 27, 1857.

The result showed a quantity of 3·7 of carbonic acid in 10,000.

The amount of carbonic acid found by Saussure (Pogg. Ann. XIX. 391) in the free atmosphere at Chambeisy, on the Lake of Geneva, was 3·8 in 10,000 as a mean of 17 experiments.

Experiments were made to ascertain the quantity of carbonic acid in closed rooms, at the Wellington barracks, under the following conditions:—

Capacity of room 7,920 cubic feet. Carbonic acid collected after 16 men had occupied the room for 6 hours. (9h. P.M.—3h. A.M.) All ventilators, except one over fire-placed, closed. Common wide grate; dimensions of chimney 6 feet from floor, 1 foot 4 by 9 inches. All doors and windows shut. Low fire in grate during experiment. Air collected 2 feet 6 inches from floor, at height of men's heads when in bed.

The result showed 12.42 volumes of carbonic acid in 10,000; from hence it was chemically determined that there was a supply by ventilation of 13.3 cubic feet per minute for each man, a quantity insufficient to remove completely all occasional effluvia. Of this it was determined that the smaller proportion only could have passed off through the chimney, the larger escaping by other accidental sources.

Four additional men on another occasion slept in the room, and the result showed the carbonic acid amounted to 14.18 in 10,000.

The most important conclusions which Dr. Roscoe draws from these determinations are, that even in cold weather, an insufficient ventilation is obtained in the soldiers' sleeping rooms by means of accidental sources of fresh air, and of the chimney draught occasioned by a small fire. In the summer, when the difference between the temperature of the outer and the inclosed air becomes very small, the ventilation by chimneys and windows alone will become more inefficient.

In order to determine how far the natural or accidental sources of ventilation supply the necessary exchange of air, in cases in which the production of carbonic acid is more rapid, several determinations were made in crowded school-rooms, in which the direct access of fresh air was more or less checked.

The result showed in one school a ventilation of six cubic feet per head per minute; in another, four cubic feet only per head per minute.

Hence it is seen that the accidental sources of ventilation are quite inadequate to furnish the requisite amount of exchange of air in the case of crowded schools.

The next point to which Dr. Roscoe directed attention was the distribution of carbonic acid throughout inhabited spaces, ventilated by a chimney draught, together with windows, doors, &c.

Dr. Roscoe in his paper says, "It has been stated that in common, unventilated dwelling-rooms, the heated carbonic acid formed by respiration, and combustion of illuminating substances, on ascending accumulates in the upper parts of such rooms, not being removed by the current of fresh air entering by the doors and windows, and issuing by the fire-place into the chimney. A permanent atmosphere rich in carbonic acid is thus supposed to exist in all inhabited rooms, not artificially ventilated at top, and persons breathing the air above the level of the chimney opening were conceived to be respiring an unhealthy air, whilst children breathing below that level, were asserted to be consuming a healthy air, free from any excessive quantity of carbonic acid.

"This supposition is rendered extremely doubtful by two purely theoretical considerations.

"1. The known laws of expansion of gases by heat.

"2. The known laws of the diffusion of gases.

"Experiment, both chemical and physical, has most fully confirmed this theoretical presumption, and has proved that in ordinary dwelling-rooms, even in the exaggerated form of crowded school-rooms, the above causes are quite sufficient to equalise, throughout the closed space, the amount of carbonic acid formed by respiration; that in fact the atmospheres of such inclosed spaces are homogeneous as regards the contained carbonic acid."

Dr. Roscoe then refers to a series of valuable observations on the direction and force of the currents in the atmosphere of a heated room lately made for the Commission on Warming and Ventilating Private Dwellings, by Mr. J. F. Campbell, the Assistant-Secretary of the Board of Health. Mr. Campbell determined the effects produced on the atmosphere of a closed room by the radiant heat from a fire, by means of thin filaments of floss-silk placed in regular position, throughout the space to be examined. The observations thus conducted show that a continual and rapid circulation of the air takes place throughout the inclosed space; the rarefied atmosphere in front of the fire rising rapidly, with a force of from 14 to 30 grains per square foot, as measured by Mr. Campbell, and spreading out along the ceiling in the direction of the cooling surfaces of the walls and windows, where it immediately falls, and is carried again forward to the fire to supply the place of the expanded air rising to the ceiling.

In order to obtain chemical evidence regarding the homogeneous nature of the inclosed atmosphere, simultaneous carbonic acid determinations were made in the air collected above and below the level of the chimney opening in several unventilated rooms.

From the results of these experiments, the full details of which are given in the paper, it is seen that in inhabited dwelling-rooms or school-rooms, the carbonic acid is distributed throughout the atmosphere, the small differences arising not only from the errors of experiment, but also from the slightly varying composition of the currents of air passing over the point at which the air was collected.

In order to determine the influence which a considerable elevation of temperature, from the combustion of large quantities of gas and the respiration of a number of persons, exerted upon the distribution of carbonic acid, two simultaneous determinations were made in the air from the pit and gallery of a fashionable crowded theatre.

By means of a system of tubes, the air was collected at a height of four feet above the stage over the stalls, and also at a distance of 30 feet directly above the first position in the front of the gallery.

Here, as was to be expected, a considerable difference was found. In air collected 34 feet above the stage, the proportion of carbonic acid was 32·12 volumes in 10,000, whilst in the air collected four feet above the stage the amount was, 23·37 in 10,000.

TIME AND DISTANCE METER.

The Paris correspondent of the *Times*, writing under date of Nov. 6th, says:—

"The directors of the Hackney Carriage Company the day before yesterday made three experiments with a new time and distance meter, invented by Van Hecke. The first was from the depôt of carriages in the Rue St Honoré to the office of the company in the Rue de Rivoli. The distance was 1,400 metres, and the time employed was 7½ minutes, being at the rate of 11,280 metres (seven miles) an hour. The second was from the office of the company to the Rue du Croissant—distance 1,145 metres, time six minutes, rate 11,460 metres an hour. The third was from the Rue du Croissant to the railway station at the Porte Maillot—distance 5,300 metres, time 25 minutes, rate 12,720 metres (about 8 miles). The meter is in the form of a small cube, from 6 to 7 centimetres square, and the application is so simple and easy that it only requires a minute to fix or remove it. The one experimented with was not completed, but notwithstanding worked with surprising regularity and precision. This instrument will give the public an exact idea of the distance run over in a given time, and consequently of the speed obtained in exchange for the money paid. To the directors it furnishes an infallible means of control as to the distances gone over in the course of the day; it will also enable them to detect when coachmen have overdriven their horses, and will thus cause a saving to the company in the wear and tear of their horses. Many persons keeping private carriages will also find an advantage in adopting the use of one of these meters, as it will enable them to detect when their coachmen use their horses and carriages for their own profit.

SOUTH KENSINGTON MUSEUM.

During the week ending 7th November, 1857, the visitors have been as follows:—On Monday, Tuesday, and Saturday (free days), 2,797; on Monday and Tuesday (free evenings), 3,261. On the three students' days (admission to the public 6d.), 352. One students' evening, Wednesday, 99. Total, 6,509.

MEETINGS FOR THE ENSUING WEEK.

MON. Architects, 8. I. Prof. T. J. Donaldson, "A Memoir of the late Herr Zanth, Architect, of Stuttgard, Wurtemberg, Honorary and Corresponding Member." II. Mr. J. B. Waring, "On the Arts connected with Architecture in Tuscany."
TUES. Civil Engineers, 8.
Statistical, 8. Mr. Samuel Brown, "Report on the International Statistical Congress at Vienna, September, 1857."
WED. Society of Arts, 8. Mr. C. Wentworth Dilke, Chairman of Council, "Address on the Opening of the One Hundred and Fourth Session."
Geological, 8. Dr. J. J. Bigsby, "On the Extent, Mineral Characters, Fossils, and Relations of the Palæozoic Basin of the State of New York."
THURS. Antiquaries, 8.
Chemical, 8. Mr. Mercer, "On a new Calotype Process."
Linnean, 8.
Philological, 8.
Royal, 8½.
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PATENT LAW AMENDMENT ACT.

APPLICATIONS FOR PATENTS AND PROTECTION ALLOWED.

[*From Gazette, November* 6.]

Dated 30*th June*, 1857.

1824. John Talbot Pitman, 67, Gracechurch-street—An improved method of making carburetted hydrogen gas. (A communication.)

Dated 29*th September*, 1857.

2498. William Wall White and William Bull, 9, Saint John's-square, Clerkenwell—Improvements in rollers applicable for blinds, maps, and other purposes.

2502. Richard Williams, 8, Bishop's-road, Victoria-park—The manufacturing of soap with materials hitherto not introduced by any person in the chemical combination of various ingredients, when manufactured known by the name of soap.

Dated 1*st October*, 1857.

2524. Sydney Doolan Hamilton, 3, Great James-street, Bedford-row—Improvements in Jacquard machinery. (A communication.)

Dated 9*th October*, 1857.

2591. Léon Pujol, Paris—Improvements in envelopes and letter-paper.

Dated 10*th October*, 1857.

2597. Claude Nicolas Leroy, Paris—Preventing accidents and collisions on railways.

Dated 14th October, 1857.

2622. C. G. Kopisch, 61, Gibson-square, Islington—Improvements in propelling vessels by means of heated air, without screw or paddle, thereby saving ship's fuel and room.

Dated 15th October, 1857.

2637. Robert Glass Balderstone, Bishopbriggs, Lanark, N.B.—Apparatus for cultivating land.

Dated 21st October, 1857.

2685. Isaac Storey and John Henry Storey, Manchester—Improvements in water gauges for steam boilers, and in taps for steam and other fluids.

2689. Robert Duke, Dover—Improvements in the means of communicating power to ships' pumps.

Dated 22nd October, 1857.

2691. John Bethell, 8, Parliament-street—Improvements in machinery or apparatus for trenching, cutting, digging, and cultivating land.

2693. Alexandre Henri Charles Chiandi, Paris—Improvements in the manufacture and combustion of certain products of peat, and in the apparatus employed therein.

2695. Thomas Hamilton and James Hamilton, Glasgow—Improvements in turning, cutting, shaping, or reducing wood and other substances.

2697. Thomas Cardwell, Manchester—Improvements in machinery for compressing cotton and other articles.

2699. James Smith, Bristol—Improvements in horsehair crinoline for petticoats.

Dated 23rd October, 1857.

2701. Benjamin Parker, Clapham—Improvements in the permanent way of railways.

2703. Robert Harrild and Horton Harrild, Farringdon-street—An improvement in the manufacture of the composition used for printers' rollers.

Dated 24th October, 1857.

2705. Felton Charles Kirkman, 38, Royal-street, Lambeth—Improvements in machinery for winding and unwinding ropes and cables, which is applicable to electric cables for submarine purposes.

2707. John Macintosh, North Bank, Regent's-park—Improvements in the construction and laying of telegraphic cables.

2709. John Michael Pearson, 4, Basinghall-street—Improvements in the manufacture of coke. (A communication.)

WEEKLY LIST OF PATENTS SEALED.

November 6th.

348. Nicholas Nomico and G. Heyes.
1277. William Hood.
1287. Ernst Ziegler.
1289. Charles William Ramié.
1291. Duncan Morrison.
1315. John Pym.
1335. James Drysdale Malcolm.
1341. William Edward Newton.
1342. William Massey and John Smith.
1344. Thos. Briggs & J. Starkey.
1366. James Sharrocks.
1373. Frederic Whitaker.
1382. Rd. Archibald Brooman.
1388. George Henry Creswell.
1427. William Clark.
1587. William Edward Newton.
1673. Alfred Vincent Newton.
1677. Thomas Wilkes Lord.

November 10th.

1324. John Davies Mucklow.
1323. Collinson Hall and Thomas Charlton.
1339. Rd. Archibald Brooman.
1343. William Massey.
1347. Edward Eley.
1348. Henry Tolkien and Joseph Middleton.
1362. David Hesse and Max Hesse.
1368. John Carr.
1381. Rd. Archibald Brooman.
1389. Joseph Ellis.
1390. Charles Cowper.
1402. Thomas Welcome Roys.
1410. Maria Bounsall Rowland.
1477. Louis Désiré Aubert.
1482. William Hart.
1514. Nathaniel Cox.
1543. George Tingle.
1986. Alfred Upward.
2183. Richard Hoe.
2298. Rudolph Sack.
2424. Richard Watson.

PATENTS ON WHICH THE STAMP DUTY OF £50 HAS BEEN PAID.

November 2nd.

2332. Nathaniel Top, John Holt, and John Partington.
2333. Isidore Alexandre Moineau, and Jean Gustave Lemasson.

November 3rd.

2441. Charles Asprey.

November 4th.

2343. Joseph Betteley.
2446. Henry Robert Ramsbotham and William Brown.

November 5th.

2357. Thomas Metcalfe.
2361. George Davis.
2382. Henry William Harman.
73. Edward Hall.

November 6th.

2393. John Wain.
2394. Eugène Rimmel.

November 7th.

2375. David Ferrier.
2384. George Ross.
2471. William Aristides Verel.

WEEKLY LIST OF DESIGNS FOR ARTICLES OF UTILITY REGISTERED.

No. in the Register.	Date of Registration.	Title.	Proprietors' Name.	Address.
4030	Nov. 5.	Smoke Preventing Chimney Pot	Alexander Pilbeam	18, Adam-street, Adelphi.
4031	„ 9.	Apparatus for holding Plates for Photographic Purposes	Burgess and Key	95, Newgate-street.
4032	„ 11.	Grater or Mill	Samuel Smith	Birmingham.

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ERRATA.

At Page 63, col. 1, line 18, for "secretary" read "architect."
,, ,, 57, col. 2, line 1 at bottom, and line 3 from bottom, for "could" read "should," and line 6 from bottom for "through" read "though."
,, ,, 71, col. 2, line 24, for "Miss" read "Messrs."
,, ,, 111, col. 1, line 34, for "mechanical" read "unmechanical."
,, ,, 113, col. 1, line 42, for "Keppell" read "Heppell."
,, ,, 128, col. 1, line 39, for "seccuderes" read "scandens."
,, ,, 173, col. 2, line 41, for "James Spiers" read "Richard James Spiers."
,, ,, 212, col. 1, line 63, for "inches" read "miles."
At Page 291, col. 2, line 18, for "undisturbed" read "undistorted."
,, ,, 357, col. 2, line 43, for "Allenheads, Thomas Sopwith," read "Thomas Sopwith, Allenheads."
,, ,, 358, col. 1, line 51, for "Creed, W., 53, Conduit-street," read "Creed, H., 33, Conduit-street."
,, ,, 425, col. 2, line 22, for "nitrogenous" read "heterogeneous."
,, ,, 498, col. 1, line 25, for "human blood" read "ox's blood."
,, ,, 499, col. 1, line 11, for "manure" read "measures."
,, ,, 524, col. 2, line 5, for "Huddersfield Mechanics' Institution, Thomas Walker (E)," read "Otley and Shipley Mechanics' Institution, Thomas Walker (E)."

R. [illegible]

SOCIETY

FOR THE ENCOURAGEMENT OF

ARTS, MANUFACTURES, AND COMMERCE,

JOHN STREET, ADELPHI, LONDON.

FOUNDED IN 1754. INCORPORATED IN 1847.

103rd SESSION, 1856-57.

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The following are the dates of the Meetings for the 103rd Session, 1856-7.

1856.	November	...	...	19	26	...
	December	3	10	17	...	...
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	March ...	4	11	18	25	...
	April ...	1	...	15	22	29
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	June ...	...	...	...	24*	...

From a very early period the Society has held Exhibitions of various kinds. Those of the last few years, it has been said, "prepared the way for the Great International Exhibition" of 1851. (Vide Jurors' Reports.) These Exhibitions, by showing what has already been done, and the degree of perfection that has been attained, tend to stimulate the progress of invention and design, and to direct attention to those points still requiring improvement.

---

* The Annual General Meeting to receive the Council's Report and Statement of the Funds of the Society, and for the Election of Officers; the Chair will be taken at Four o'Clock.

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Samson Ricardo, M.P.
James Thomas Agar Robartes, M.P.
Col. the Hon. George Rushout, M.P.
Henry Danby Seymour, M.P.
Marquis of Stafford, M.P.
Lord Stanley, M.P., *Vice President.*
Robert Stephenson, M.P., F.R.S., *Vice President.*
William Tite, M.P., F.R.S.
Charles Towneley, M.P., F.R.S.
Sir Joshua Walmsley, M.P.
William Wells, M.P.
James Whatman, M.P., F.R.S.
H. Wickham Wickham, M.P.
William Arthur Wilkinson, M.P.
John Wilson Patten, M.P.
Basil Thomas Woodd, M.P.

COMMITTEES OF REFERENCE.

The subjoined list of *Members of the Society only,* is published in accordance with the following Bye-law:—

"36. The Council shall proceed, as soon as convenient after the Annual General Meeting, to form Lists of those who may be considered specially eligible to serve with others on such Committees of Reference as may be appointed from time to time. To these Committees the Council may refer for examination, advice and report, such discoveries, inventions, improvements, and novelties in Arts, Manufactures, and Commerce, and other matters, as shall from time to time be brought under its notice. The names of the members so selected to serve on the several Committees of Reference shall be published in the *Journal* of the Society, and due notification of the Council's desire to obtain their co-operation and advice shall be given to each member."

ART.

Sir Charles Barry, R.A., F.R.S.	Architecture.
James Bell, M.P.	Architecture.
John Bell	Sculpture.
Henry R. Bradbury	Printing.
R. E. Branston	Wood Engraving.
Vincent Brooks	Lithography.
Decimus Burton, F.R.S.	Architecture.
Francis Stephen Cary	Painting.
Alfred E. Chalon, R.A.	Painting.
Robert Dennis Chantrell	Architecture.
Antoine Claudet, F.R.S.	Photography.
Edward Clowes	Printing.
George Clowes	Printing.
John Coe	Printing.
Henry Cole, C.B., *Vice President*	
Dominic Colnaghi	Engraving.
John Gregory Crace	Decoration.
Hon. Edward Cecil Curzon	Ancient Art.
Philip Henry Delamotte	Wood Engraving & Photography.
William Day	Lithography.
C. Wentworth Dilke, B.C.L., *Vice President.*	
Roger Fenton	Photography.
Augustus W. Franks	Ancient Art.
Peter Wickins Fry	Photography.
Edward Hailstone	Ancient Art.
Michael Hanhart	Lithography.
Philip Hardwick, R.A., F.R.S.	Architecture.
B. Waterhouse Hawkins	Modelling.
M. Rohde Hawkins	Architecture.
Henry Thomas Hope	Ancient Art and Decoration.
Owen Jones	Ancient Art and Decoration.
Rev. William Towler Kingsley, B.D.	Photography.
John Henry Lance	Painting.
George Cargill Leighton	Printing in Oil Colours.
John Leighton	General Art and Decoration.
George Mair	Architecture.
Count de Montizon	Photography.
William Mulready, R.A.	Painting.
Mathew Noble	Sculpture.
Rev. John L. Petit	Architecture.
David Roberts, R.A.	Painting.
Henry Roberts	Architecture.
Sir William C. Ross, R.A.	Painting.
William Rowney	Lithography.
Sidney Smirke, A.R.A.	Architecture.
John Thompson	Wood Engraving.
William Tite, M.P.. F.R.S.	Architecture.
Henry R. Twining	Painting.
John Uwins, R.A.	Painting.
John Webb	Ancient Art.
Charles Whittingham	Printing.
Matthew Digby Wyatt	Architecture and Decoration.
Leonard C. Wyon	Medals.

MANUFACTURES.

Edward Akroyd.
John Bettridge, jun.
Samuel Holden Blackwell
John Marriott Blashfield
Henry Blundell
Thomas William Booker, M.P.
Thomas Broadwood
John Brocklehurst, M.P.
Charles Brook
Robert Brown
John Bull
Joseph Burch
William Caldecott
Robert Lucas Chance
William Charley
Charles Thornton Coathupe
George Courtauld
Frank Crossley, M.P.
John Crossley
Joseph Curling
Abraham Darby
Thomas De La Rue
Thomas Dickins
Henry Doulton
Robert T. Fauntleroy
Henry Forbes
John Foster
Sebastian Garrard
Thomas Field Gibson, F.G.S.
Stephen Green
Warren S. Hale
Charles Frederick Hancock
John Heathcote, M.P.
Charles Hindley, M.P.
Michael Daintree Hollins
Herbert Mountford Holmes
George Norgate Hooper
Samuel Morton Hubert
George Tawke Kemp
Robert William Kennard
Alfred Lapworth
John Robert Lavanchy
Frederick Levick
William Liddiard
Sampson Lloyd
Samuel Messenger
Robert Milligan, M.P.
Herbert Minton
John Augustus Nicholay
Apsley Pellatt, M.P.
James Pilkington, M.P.
Arthur Powell
Nathaniel Powell
Charles Augustus Preller

John Proctor
James Rock, jun.
Titus Salt
William Butler Simpson, *Auditor.*
John Jobson Smith
Henry Spicer
William Revel Spicer
William Stones
Henry Thompson
James Vavasseur
Samuel Waterhouse
Joshua Proctor Brown Westhead
John Wilkinson
Edward Wilson
Thomas Winkworth, *Mem. of Council*
Henry Woods

COLONIES AND COMMERCE.

Joshua Bates
Francis Bennoch
William Bird
Charles Henry Blake
Edgar A. Bowring
John Strettell Brickwood
William Brown, M.P.
Robert Wigram Crawford
John Dillon
Sir James Duke, Bart., M.P.
John Griffith Frith
John Peter Gassiott, F.R.S.
James William Gilbart, F.R.S., *Treasurer*
Peter Graham, *Mem. of Council.*
Samuel Gregson, M.P.
Earl Grey
William Hawes
Thomson Hankey, M.P.
Thomas F. Henley
Jonathon Hopkinson
Alexander Constantine Ionides
Henry Johnson
Professor Leone Levi
Matthew Marshall, *Mem. of Council*
George Moffatt, M.P., *Vice President*
John Morley
Samuel Morley
Benjamin Oliveira, M.P., F.R.S.
Lord Overstone
John Patterson
John Distin Powles
William George Prescott, F.G.S.
George Prevost
Alfred Reade
Henry Roberts
John Forbes Royle, M.D., F.R.S.
David Salomons
William Wilson Saunders, F.R.S.
Peter Lund Simmonds
Col. W. H. Sykes, F.R.S., *Chairman of Council*
Robert Temple
John Ingram Travers
Matthew Uzielli
Thomas Winkworth, *Mem. of Council*

AGRICULTURE.

Thomas Dyke Acland
Robert Baker
James Beadel
Sir John P. Boileau, Bart., F.R.S.
James Caird
Col. Challoner
John Clutton
John Evelyn Denison, M.P.
Francis Fuller
John Girdwood
Chandos Wren Hoskyns
Rev. Anthony Huxtable
John Bennet Lawes, F.R.S.
John Joseph Mechi, *Mem. of Council*
Philip W. S. Miles
John C. Morton
Sir Joseph Paxton, M.P., *Vice Pres.*
Lord Portman
Thomas Scott
Bettesworth Pitt Shearer
Prof. John Wilson, F.R.S.E.

METALLURGY AND MINING.

Professor Ansted
Samuel Holden Blackwell
Robert Hunt, F.R.S.
Robert William Kennard
Herbert Mackworth
Thomas Sopwith, F.R.S.
John Taylor, jun.
James Tennant

CHEMISTRY AS APPLIED TO ARTS.

Jacob Bell, F.L.S.
F. Crace Calvert
Dugald Campbell
Warren De La Rue, F.R.S.
Michael Faraday, F.R.S.
Dr. Joseph Henry Gilbert
Thomas Hetherington Henry, F.R.S.
Capt. L. L. Boscawen Ibbetson, F.R.S.
John Bennet Lawes, F.R.S.
G. Dixon Longstaff, M.D.
Henry Medlock
Thomas N. R. Morson
John C. Nesbit
John H. Pepper
Dr. Lyon Playfair, C.B., F.R.S. *Vice Pres.*
Alfred Smee, F.R.S.
Edward Solly, F.R.S. *Mem. of Council*
Dr. Alex. W. Williamson, F.R.S.
George Fergusson Wilson, F.R.S., *Mem. of Council*

MECHANICS AND ENGINEERING.

William Bridges Adams
Charles Edward Amos
John George Appold, F.R.S.
William George Armstrong, F.R.S.
Charles Atherton
Arthur Kett Barclay, F.R.S.
William Henry Barlow, F.R.S.
Charles Beyers
George Bishop, F.R.S.
Thomas Evans Blackwell
John Braithwaite
Isambard Kingdom Brunel, F.R.S.
Earl of Caithness
John Chubb
Daniel Kinnear Clark
William Fothergill Cooke
George Cottam
Thomas Russell Crampton
Alexander Angus Croll
Robert Davison
Edward Beckett Denison, Q.C.
John Bailey Denton
Lieut.-Col. Eardley-Wilmot, R.A.
J. Edward Errington
William Fairbairn, F.R.S.
Peter Fairbairn
Joshua Field, F.R.S.
Benjamin Fothergill
John Fowler
John Fowler, jun. (Bristol)
Sir Charles Fox
Charles Frodsham
Robert Garrett
John Viret Gooch
Joseph Glynn, F.R.S., *Member of Council*
Charles Greaves
Francis Seymour Haden
Earl of Hardwicke
John Hawkshaw, F.R.S.
John Henderson
Henry Hensman
John Hick
Edward Highton
Alfred Charles Hobbs
Samuel Collett Homersham
Edward Humphrys
Alfred Stainstreet Jee
Capt. Robert Michael Laffan, M.P., R.E.
Charles William Lancaster

Joseph Locke, M.P., F.R.S.
Edward Thomas Loseby
Charles Manby, F.R.S.
Henry Maudslay
Joseph Maudslay
Thomas Maudslay
Charles May, F.R.S.
John Robinson McLean
Andrew Murray
John Murray
Lieut.-Col. Henry C. C. Owen, R.E., C.B.

Thomas Page
John Penn
James Platt
William Alexander Provis
John Urpeth Rastrick, F.R.S.
James Meadows Rendel, F.R.S.
Sir John Rennie, F.R.S.
J. Scott Russell, F.R.S., *Vice Pres.*
Charles William Siemens
James Simpson
William Simpson

Robert Stephenson, M.P., F.R.S., *Vice President.*
Cornelius Varley
Charles Vignoles, F.R.S.
James Walker, F.R.S.
Thomas Webster, F.R.S.
William Weallens
Joseph Whitworth
Henry Wilkinson
Edward Woods

INDUSTRIAL INSTRUCTION.

Lord Ashburton, F.R.S., *Vice Pres.*
Rev. Thomas Bacon
Hon. and Rev. S. Best
Rev. Dr. Booth, F.R.S., *Treasurer*
Rev. W. R. Bowditch
Harry Chester, *Vice Pres.*
Rev. Samuel Clark
James Cornwell, Ph. D.
Viscount Ebrington, M.P., *Vice Pres.*
Rev. William Elliott
William Ellis
William Ewart, M.P., *Vice Pres.*
Joshua G. Fitch, M.P.
William Johnson Fox, M.P.
Ven. Archdeacon Lane Freer
Earl Granville, F.R.S., *Vice Pres.*
Earl of Harrowby, F.R.S., *Vice Pres.*

Dean of Hereford, *Vice Pres.*
Rev. Lord Arthur Hervey
Rev. J. Saul Howson, M.A.
J. W. Hudson, Ph. D.
Edward Hughes
William Hutt, M.P., *Vice Pres.*
Charles Knight
Edward Riley Langworthy
Dr. Robert Gordon Latham, F.R.S
Ralph Robert Wheeler Lingen
Rev. Charles Mackenzie, M.A.
The Bishop of Manchester
Rev. Muirhead Mitchell
Rev. John Pilkington Norris
Dr. Lyon Playfair, C.B., F.R.S., *Vice Pres.*
Wyndham S. Portal

Prior Purvis, M.D.
Samuel Redgrave
Henry Reeve
John S. Reynolds
Rev. Arthur Rigg
Dean of St. Paul's
Dean of Salisbury, F.R.S.
Francis R. Sandford
Lord Stanley, M.P., *Vice Pres.*
Col. W. H. Sykes, F.R.S., *Chairman of Council*
Jelinger C. Symons
Rev. Frederick Temple
Edward Carleton Tuffnell
Rev. Dr. Vaughan (Harrow)
Rev. Richard Whittington
The Bishop of Winchester

SANITARY SCIENCE.

H. Wentworth Acland, M.D., F.R.S.
Marquis of Blandford, M.P.
John Brady, M.P.
Robert Scott Burn
Edwin Chadwick, C.B.
Thomas King Chambers, M.D.

Viscount Ebrington, M.P., *Vice Pres.*
William Farr, M.D., F.R.S.
James Glaisher, F.R.S., *M. of Council*
William Hawes
Henry Bence Jones, M.D., F.R.S.

Waller Lewis, M.D.
Prof. Owen, F.R.S.
Benjamin Ward Richardson, M.D.
Thomas Twining, jun., *Vice Pres.*
George Wylde, M.D.

LIST OF EXAMINERS

OF STUDENTS FROM CLASSES AT MECHANICS' INSTITUTES.

George Biddell Airey, F.R.S.
John Ball
John Bell
Adolphus Bernays, Ph.D.
W. Sterndale Bennett
Rev. James Booth, LL.D., F.R.S., *Treasurer.*
Professor J. S. Brewer, M.A.
Charles Brooke, M.A., F.R.S
Professor R. W. Browne, M.A.
Hon. and Rev. Samuel Best
James Caird
Francis Stephen Carey
William B. Carpenter, M.D., F.R.S.
Harry Chester, *Vice Pres.*
Rev. Samuel Clark, M.A.

Viscount Ebrington, M.P.
Rev. E. Elder, D.D.
Rev. W. Elliott, M.A.
James Glaisher, F.R.S., *M. of Council*
George Godwin, F.R.S.
Professor T. M. Goodeve
Professor Hall.
Rev. Dr. Harris
B. Waterhouse Hawkins
Professor Arthur Henfrey, F.R.S.
The Dean of Hereford, *Vice Pres.*
Rev. James Hill.
John Hullah
Professor Hoppus
Robert Hunt, F.R.S.
Thomas Henry Huxley, F.R.S.

George H. Jay
Henry Bence Jones, M.A., M.D., F.R.S.
Professor Mariette
Rev. Canon Moseley
John C. Morton.
Rev. A. Bath Power, M.A.
Francis R. Sandford, B.A.
Dr. William Sharpey.
John Simon, F.R.S.
Edward Solly, F.R.S., *M. of Council*
John Stenhouse, LL.D., F.R.S., *M. of Council*
Rev. Frederick Temple, M.A.
Thomas Watson, M.D.
Professor John Wilson, F.R.S.E.

HONORARY LOCAL SECRETARIES.

William Axon, for Chester.
William Sands Cox, F.R.S., for Birmingham.
John Darlington, for Bradford.
William Felkin, for Nottingham.

Henry Newall, for Rochdale.
William Macdowel Tartt, for Cheltenham.
John Waterhouse, F.R.S., for Halifax.

LIST OF MEMBERS

AND DATE OF ELECTION.

1844. H.R.H. The PRINCE ALBERT, K.G., D.C.L., F.R.S., &c., &c.

1854. Abbott, Robert, 23 High Holborn
1856. Abel, F. A., Chemical Department, Royal Arsenal, Woolwich
1856. Acland, Henry Wentworth, M.D., Oxford
1824. Acland, Sir Thomas Dyke, Bart., M.P., F.R.S., 85 Jermyn street
1854. Acland, Thomas Dyke, Sprydoncote, Exeter
1856. Adams, George G., 126 Sloane street
1854. Adams, John, 9 Glenmohr terrace, Hyde Vale, Blackheath
1852. Adams, Robert, Falkirk
1853. Adams, William, Ebbw Vale Works, near Newport, Monmouthshire
1847. Adams, William Bridges, 1 Adam street, Adelphi
1853. Adye, Lieut.-Col. J. Miller, C.B., R.A., Woolwich
1816.*Ainger, Alfred, 2 Carlton hill, Edgware road
1852. Akroyd, Edward, Halifax
1854. Albrecht, John, 27 Victoria street, Westminster
1853. Allan, James, 7 York terrace, Regent's park
1853. Allan, Thomas, 1 Adelphi terrace
1853. Allcroft, John Derby, 97 Wood street, City
1855. Alexander, Caledon, The Auberries, Sudbury, Suffolk
1852. Allen, The Ven. Archdeacon, Shrewsbury
1847. Allen, George John, Dulwich College
1855. Allen, Joshua Julian, 20 Bedford row
1855. Allison, George, Darlington
1845. Allison, Joseph, 238 Regent street
1849. Allison, Ralph, 108 Wardour street, Soho
1852. Allport, James, Midland Railway, Derby
1855. Almgill, Thomas, 27 Birch street, Waterloo road, Manchester
1822.*Ames, John, Clevelands, near Lyme, Dorset
1845.*Ames, Lionel, The Hyde, St. Alban's
1843. Amos, Charles Edward, The Grove, Southwark
1855. Anderson, John, H.M. Arsenal, Woolwich
1852. Anderson, Sir Charles H. J., Bart., Lea Hall, Gainsborough
1849. Anderson, Sir James, M.P., Glasgow
1856. Anderton, Arthur, Norwood
1847. Anderton, James, 20 Bridge street, Blackfriars
1854. Andrews, John, 4 Grand Parade, Brighton
1848. Andrews, Lieut.-Col., 13 Onslow cresc., Brompton
1850. Angell, Joseph, 10 Strand
1851. Ansted, David Thomas, M.A., F.R.S., 17 Manchester street, Manchester square
1856. Anthony, Charles, Hereford
1826.*Antrobus, Sir Edmund, Bart., 146 Piccadilly
1853.*Appold, John George, F.R.S., 23 Wilson st., Finsbury
1850. Archibald, Charles Dickson, F.R.S., Rusland hall, Kendall, Lancashire
1854. Armstrong, William George, F.R.S., Newcastle-on-Tyne
1854. Ashburton, Lord, F.R.S., Bath house, 82 Piccadilly
1850. Ashurst, William Henry, 6 Old Jewry
1852. Ashworth, Joseph, Pendleton, near Manchester
1852. Asperne, William Dent, London and Westminster Bank, 86 Whitechapel
1855. Aston, Theodore, 2 Pump court, Temple
1853. Aston, William, Hereford
1855. Atherton, Charles, Royal Dockyard, Woolwich
1855. Atkinson, George Clayton, Wylam hall, Newcastle-on-Tyne
1852. Atkinson, John Staines, Rochester
1849.*Atkinson, William, 8 Taviton street, Gordon square
1856. Aubert, John Lewis, Nunsbury, near Cheshunt, Herts, and Lower road, Islington
1856. Auckland, John Tattersall, Lewes
1851. Auldjo, John, F.R.S., Noel house, Kensington
1822.*Austin, Benjamin, 6 Montague place, Russell sq
1855. Avery, John, 32 Essex street, Strand

1856. Babb, George, 346 Strand
1856. Babington, Charles Metcalfe, M.D., 29 Hertford street, May fair
1855. Bacon, Rev. Thomas, Kingsworthy Rectory, Winchester
1856. Bagnall, Charles, West Bromwich
1854. Bailey, Edwin, Cirencester
1821. Bailey, George, 13 Lincoln's inn fields
1810.*Bailey, Sir Joseph, Bart., M.P., 26 Belgrave sq., and Nantyglo, near Abergavenny
1855. Bainbridge, Robert Walton, Middleton house, Middleton in Teesdale, Darlington
1852. Baker, George, 13 Princes gate, Kensington
1856. Baker, Robert, Writtle, Chelmsford, Essex
1849. Baker, William, 30 Cranbourn st., Leicester sq.
1855. Baker, William, Fenton, Staffordshire Potteries
1855. Ball, Edward, M.P., Warwick square, Pimlico
1823.*Balcarras, the Earl of, 21 Berkeley square
1853. Ball, John, 57 Coleman street, City
1852. Banes, George Dann, H.M. Dockyard, Chatham
1848. Banks, Rev. S. H., D.C.L., Dullingham, Newmarket
1851. Barber, George, 50 Mark lane
1826.*Barclay, Arthur Kett, F.R.S., Park st., Southwark
1853. Barclay, Henry Ford, the Gutta Percha Company, 18 Wharf road, City road
1852. Barker, Thomas Herbert, M.D., Bedford
1847. Barlow, Charles, 89 Chancery lane
1855. Barlow, Robt. Sharp, Bolton-le-moors, Lancashire
1855. Barlow, Wm. Henry, F.R.S., Field House, Derby
1854. Barlow, Rev. John, M.A., F.R.S., 5 Berkeley st., Piccadilly
1821.*Barlow, Peter, F.R.S., Royal Military Academy, Woolwich
1853. Barnard, John Ansley Louis, 25 Holloway place, Holloway
1854. Barnard, John Edward, Merlin Haven, near Wotton-under-edge
1856. Barnes, Richard, 15 Parliament street
1854. Barnes, Thomas, M.P., Farnworth, Bolton

1856. Barnes, William, Cradock street, Swansea
1849.*Barnett, Miss M. G., 5 Gloucester terrace, Regent's park
1853. Barron, Francis J., 436 Strand
1855. Barry, John S. Tottenham, 2 Copthall buildings, City
1835. Barry, Sir Charles, R.A., F.R.S., 1 Old Palace yd., Westminster
1835. Barton, William Henry, Royal Mint
1851. Baskcomb. G. H., Chislehurst, Kent
1854. Bastard, Thomas Horlock, Charlton, Blandford, Dorset
1840.*Bateman, Joseph, LL.D., Ashton-under-Lyne
1836. Bates, Joshua, 21 Arlington street, Piccadilly
1854. Bath and Wells, Bishop of, Palace, Wells
1856. Batt, Henry, North street, Wandsworth
1850. Bax, Edward, 1 Charing cross
1852. Baxter, Robert Dudley, Highfield, Doncaster
1855. Bayliss, Alex. J. 44 Torrington square
1852. Bayliff, Rev. Thomas T. L., Bishop's Stortford
1852. Beadel, James, 25 Gresham street, City
1852. Beard, John Barron, 12 Egremont pl., King's cross
1853. Beardsill, Isaac, Thongsbridge, near Huddersfield
1844. Beattie, Joseph, Railway Station, Nine Elms
1853. Beaumont, Wentworth Blackett, M.P., 144 Piccadilly
1853.*Beldam, Valentine, Royston
1855. Bell, Edward, C.E., Sidney
1856. Bell, Gavin Mason, 17 Cannon street, City
1854. Bell, Jacob, F.L.S., 15 Langham place
1847. Bell, James, M.P., 1 Devonshire place, Marylebone
1847. Bell, John, 15 Rutland gate, Hyde park
1854. Bellford, Auguste E. L., 32 Essex street, Strand
1832. Belper, Right Hon. Lord, 42, South street, Grosvenor square
1853. Belshaw, Thomas, Crystal Palace, Sydenham
1856. Benham, Frederick, 19 Wigmore street
1856. Benham, John Lee, 19 Wigmore street
1851. Bennett, John, 65 Cheapside
1845. Bennett, Joseph, 20 South parade, St. James's pk
1853. Bennison, William, 4 Fitzroy square
1852. Bennoch, Francis, 77 Wood street, Cheapside
1856. Benson, Samuel S., 16 Cornhill
1856. Bentley, Professor Robert, 6 St. Mark's crescent, Gloucester road, Regent's park
1849. Bentley, John, 9 Portland place, and Burch house, Lancaster
1854. Berger, Edward, Farquhar house, Hornsey lane, Highgate.
1850. Bessemer, Henry, 4 Queen street place, New Cannon street
1855. Best, Hon. Robt. Rainey, 144 Warwick st. Pimlico
1853. Best, Hon. and Rev. Samuel, M.A., Abbott's Ann, Andover
1849. Best, William, Gresham Club, City
1853. Bethell, John, 8 Parliament street, Westminster
1843. Bethell, Sir Richard, M.P., 3 Stone buildings, Lincoln's inn
1848. Bettridge, John, jun., 6 Halkin street west, Belgrave square
1848.*Betts, Edward Ladd, 9 Great George street, Westminster
1849. Beyers, Charles, 9 Hyde rd., Ardwick, Manchester
1854. Bigelow, Erastus Brigham, Boston, U.S.
1853. Bigg, Henry Heather, 15 Weymouth street, Portland place
1852. Bird, James, 8 Seymour street west, Connaught sq.
1851. Bird, Thomas, 7 Richmond buildings, Dean street, Soho
1851. Bird, William, 2 Laurence Pountney hill, Cannon street
1853. Birks, Edward, Sheffield
1855. Birkett, John, 59 Green st., Grosvenor square
1850. Birt, Jacob, 30 Sussex gardens, Hyde park.
1855. Bishop, John, 4 North Audley street, Grosvenor square
1822. Bishop, George, F.R.S., South villa, Inner circle, Regent's park
1850. Blackwell, Samuel Holden, Russell's hall, West Dudley
1844. Blackwell, Thomas Evans, Cornwallis grove, Clifton, Bristol
1853. Bladen, Thomas, Uttoxeter
1853. Blair, Harrison, Ashwood lodge, near Manchester
1850. Blake, Charles Henry, 4 Stanley villas, Notting hill
1852. Blanchard, Colonel, C.B., 7 Ulster ter., Regent's pk
1852. Bland, William Russell, 153 Fleet street
1854. Blandford, Marquis of, M.P., 36 Brook street
1842.*Blashfield, John Marriott, Cement Factory, Mill Wall, Poplar
1853. Blews, W. H. M., Birmingham
1856. Bleekrode, Professor, Royal Academy of Holland, Delft.
1852. Bloomfield, Joseph Barber, Poole, Dorsetshire
1854. Blount, John Patterson, 2 Lonsdale sq., Islington
1853. Blundel, Henry, Hull
1823. Bodkin, Wm. Henry, 8 King's bench walk, Temple
1849. Bohn, Henry George, York street, Covent garden
1847. Boileau, Sir John Peter, Bart., F.R.S., 20 Upper Brook street
1852. Bolton, Thomas, 3 Danes inn, St. Clements, Strand
1851. Bond, Edward, 176 Oxford street
1849. Bone, William, jun., 76 Fleet street
1854. Bonham-Carter, John, M.P., Petersfield, and 4
1855. Bonham-Carter, William, Portsmouth
Suffolk place, Pall Mall
1852. Bonsor, James, 104 Fore street, Cripplegate
1842.*Booker, Thomas William, M.P., Velindra house, Cardiff
1853. Boosey, Samuel, 7 Nutford place, Edgware road
1852. Booth, Rev. James, D.C.L., F.R.S., the Vicarage, Wandsworth
1854. Boothby, Charles Edward, Privy Council Office, Whitehall
1822.*Bosanquet, Augustus, 32 Fenchurch street
1830.*Botfield, Beriah, F.R.S., 10 Sackville st. Piccadilly
1856. Boucher, John, Surrey villas, Camberwell
1852. Boughton, Peter, Hounslow
1853. Boulton, George, 21a Northampton sq.
1851. Bowden, Thomas, 1 Sunfield terrace, Shooter's hill road, Blackheath
1855. Bowditch, Rev. W. R., B.A., St. Andrew's, Wakefield
1838.*Bowen, James Hill, 1 Whitehall
1838. Bower, George, 6 Tokenhouse yard, City
1854. Bower, George, St. Neot's, Huntingdon
1853. Bowring, Edgar Alfred, Board of Trade, Whitehall
1855. Bowman, John, 9 King William street, City
1855. Boxer, Capt. Edward Mounier, R.A., Woolwich
1856. Brackenbury, Rev. John Matthew, M.A., Wimbledon, Surrey
1829.*Braby, James, 18 Cranmer place, Waterloo road
1854. Bradbury, Henry Riley, Whitefriars
1850. Brady, Antonio, Admiralty, Somerset house
1854. Brady, John, M.P., 1 Warwick terrace, Pimlico
1844. Brae, Andrew Edmund, Park square, Leeds
1852. Braikenridge, Francis Jerdone, 16 Bartlett's buildings, Holborn
1852. Braikenridge, George John, 16 Bartlett's buildings, Holborn
1819. Braithwaite, John, 42 Gower street, Bedford sq.
1855. Brand, George, 1 James street, Adelphi.
1851. Brandon, Woodthorpe, 1 Robert street, Adelphi.
1838. Branston, Robert Edward, 36 St Andrew's hill, Doctor's Commons
1856. Brassey, Thomas, 4 Great George st., Westminster
1851. Brettle, Edward, 119 Wood street, City
1852. Brewer, Wm., M.D., 21 George st., Hanover sq.
1835. Brickwood, John Strettell, 26 Upper Brunswick place, Brighton
1853. Bridson, Henry, Bolton-le-Moors, Lancashire
1853. Briggs, Arthur Rennie, Lewes, Sussex

1812.*Bristol, the Marquis of, F.R.S., 6 St. James's sq.
1853. Broad, Charles Wm., 6 Beach street, Dover
1850. Broad, Robert, Horseley Iron Works, Tipton, Staffordshire
1806. Broadwood, Thomas, 17 Cadogan pl., Belgrave sq.
1838. Brocklehurst, John, M.P., 33 Milk st., Cheapside
1855. Brodie, Joseph, Shotley bridge, Gateshead
1845. Brook, Charles, Healey house, Huddersfield
1850. Brook, Richard Joseph, 1 Poultry, City
1856. Brooke, Charles, F.R.S., 29 Keppel street, Russell square
1842.*Brookes, William, 25 Mark lane
1853. Brookes, William, 73 Chancery lane
1851. Brooks, Henry, 3 North place, Cumberland market, Regent's park
1851. Brooks, Samuel William, 32 Cardington street, Hampstead road
1854. Brooks, Vincent, King street, Covent garden
1844. Brooman, Richard Archibald, 166 Fleet street
1855. Brown, Joseph, 14 Clarence ter., Regent's park
1856. Brown, Thomas James, 24 Leicester square
1847. Brown, Humphery, M.P., 2 Little Smith street, Westminster, and Tewksbury
1857. Brown, Robert, Etruria, Staffordshire
1852. Brown, Robert Charles, 4 Robert st., Adelphi
1850. Brown, Robert J., 23 Savile row
1851. Brown, Samuel, 11 Lombard street
1853. Brown, William, M.P., Richmond hill, near Liverpool, and Fenton's Hotel, St. James's street
1853. Brown, William, Curzon park, Chester
1853. Brown, William George, 9 Whitehorse lane, Stepney
1855. Browne, Henry, White House, London lane, Hackney
1844. Browne, Lieut.-Colonel Henry, H.E.I.C.S., 28 Soho square
1854. Browne, Rev. J. C., D.C.L., Dudley, Worcestershire
1855. Browning, Richard, jun., 36 Little Windmill st., Golden square
1821.*Browning, James, 113 St. John street
1847.*Brunel, Isambard Kingdom, F.R.S., 18 Duke st., Westminster
1838. Buccleuch, the Duke of, K.G., D.C.L., F.R.S., Montague house, Whitehall
1852. Buckley, Major-Gen., M.P., New hall, Salisbury
1850. Bull, John, 52 St. Martin's lane, and Chiswick
1854. Bullen, Edward, M.A., 37 Golden square
1849. Bunn, Lockington, 19 Walbrook
1851. Burch, Joseph, Crag Works, Macclesfield
1854. Burke, Edmund, Norfolk road, St. John's wood
1851. Burn, R. Scott, Bank cottage, Eaton Norris, Stockport
1850. Burnet, Boyd, 2 Piazza, Covent garden
1855. Burnell, H. D. H., School house, Brockham, Reigate
1855. Bury, John, Warwick house, Warwick court, Holborn
1850. Burstall, Robert Kilby, 15 Hanover st., Long Acre
1849. Burt, Henry Potter, Upton cottage, Tulse hill
1852. Burton, Alfred, 36 Marina, St. Leonard's
1829.*Burton, Decimus, F.R.S., 6 Spring gardens
1854. Burton, William S. 39 Oxford street
1852. Bushell, Frederick William, Basingstoke
1850. Butler, Charles Salisbury, M.P., Cazenones, Upper Clapton, Middlesex
1854. Butler, Paul, 1 Lowndes square
1854. Buxton, Charles, The Brewery, Spitalfields

1824.*Cabbell, Benjamin Bond, M.P., F.R.S., 1 Brick court, Temple
1854. Caird, James, 6 Serjeant's inn, Temple
1854. Cairns, Hugh M'Calmont, M.P., 5 New square, Lincoln's inn
1851. Caithness, Earl of, Barrogell castle, Thurso, N. B.
1854. Caldicott, William, Freighton lodge, near Colchester
1852. Calvert, Frederick Crace, Manchester
1856. Callaghan, William, 23 New Bond street
1851. Cameron, Hugh Innes, 1 Hyde park gate, Kensington gore
1855. Campbell, James, 158 Regent street
1849. Campbell, Dugald, 7 Quality court, Chancery lane
1848.*Campbell, Duncan, Emlyn cottage, Newcastle Emlyn, South Wales
1846. Campin, Frederick William, 156 Strand
1853. Canning, Viscount, 10 Grosvenor square
1853. Cantrell, William, Wirksworth
1854. Capel, Rev. George, Carshalton, Surrey
1854. Caplin, Dr. J., 9 York place, Portman square
1843. Carlile, James Emlyn, Hampstead
1851. Carlisle, the Earl of, F.R.S., 12 Grosvenor place
1856.*Carpenter, Dr. W. B., F.R.S., University hall, Gordon square
1856. Carr, Anthony, 4 Clarendon villas, Loughborough park, Brixton
1855. Carruthers, C. B., Norwood
1851. Carter, John, Park lodge, Park road, Stockwell
1853.*Carthew, Peter, St. Mary Abbott's terrace, Kensington
1852. Cartwright, Peplow, Oswestry
1856. Cartwright, Samuel, jun., 32 Old Burlington st.
1847. Cary, Francis Stephen, 21 Bloomsbury street, Bedford square
1855. Case, John March, Berrylands, Kingston-on-Thames
1851. Cassell, John, 35 Acacia road, St. John's wood
1855. Castleman, Charles, St. Ives house, Ringwood, Hants
1854. Castle, Henry James, 7 Chancery lane
1851. Causton, Joseph, 47 Eastcheap, City
1853.*Cawdor, Earl of, F.R.S., Stackpole court, Pembroke, and 74 South Audley street
1853. Chadwick, David, Salford
1847. Chadwick, Edwin, C.B., 9 Park villas, Richmond
1852. Chaffers, Alexander, 43 Bedford row
1852. Chalk, James Jell, 8 Warwick sq., Pimlico
1852. Challis, Thomas, M.P., Wilson street, Finsbury
1852. Challinor, William, Leek
1851. Challoner, Colonel, Portnall park, Chertsey
1855.*Chalon, Alfred E., R.A., El Retiro, Campden hill, Kensington
1855. Chambers, David Noble, 47 Paternoster row
1852. Chambers, George, High Green house, near Sheffield
1854. Chambers, Thomas King, M.D., 1 Hill st., Berkeley square
1854. Chambers, William, Hafod, Rhayader, S. Wales
1855. Chance, Frank, St. Bartholomew's Hospital
1852. Chance, Robert Lucas, Glass Works, near Birmingham
1855. Chantrell, George Frederick, Dale st., Liverpool
1849. Chantrell, Robert Dennis, 4 St. Mary's road, Canonbury
1847. Chaplin, William, jun., 13 Henrietta street, Cavendish square
1855. Chapman, Thomas, F.R.S., 14 Montague place, Bryanston square
1850. Chapman, Edward, 13 Bolton's, West Brompton
1854. Charley, William, Seymour hill, Belfast
1856. Chater, Henry, 8 Montagu place, Russell sq.
1856. Chater, Joseph, Old Grove house, Hampstead
1852. Chester, Harry, Privy Council Office, Whitehall
1855. Chevallier, George Smart, 73 Chancery lane
1856. Christian, Robert, 16 Waterloo place
1853. Child, George, 12 Bath place, Dalston
1853.*Child, William Dimsdale, 8 Finsbury pl. South
1854. Childs, James, Inner Park road, Wimbledon park, Surrey
1849. Chown, Henry, 28 St. Swithin's lane, City
1848. Chubb, John, St. Paul's churchyard
1852. Chubb, W. T., Fordingbridge
1843. Clarendon, the Earl of, K.G., 1 Grosvenor crescent, Belgrave square
1854. Clark, Daniel Kinnear, 11 Adam st., Adelphi

1856. Clark, Joseph Lester, 1 River lane, Islington
1853. Clark, Rev. Samuel, Training College, Battersea
1855. Clarke, Hyde, D.C.L., 42 Basinghall street
1856. Clarke, Rev. Charles, Esher, Surrey
1847. Clarke, Robert, 8 St. George's ter., Regent's pk.
1855.*Clarke, Tanner Owen, 5 Lime street square
1855. Clarke, William, 11 John street, Adelphi
1842. Claudet, Antoine, F.R.S., 107 Regent street
1855. Clay, William, Patent Salt Works, Droitwich
1854. Clench, Edmund, Balham hill
1853. Clive, the Venerable Archdeacon, Welshpool
1851. Clowes, Edward, 18 Endsleigh st., Tavistock sq.
1851. Clowes, George, 57 Russell square
1853. Clutton, John, 8 Whitehall place
1852. Clutton, Rev. Ralph, Saffron Walden
1838.*Coathupe, Charles Thornton, 3 Park row, Bristol
1849. Cobbett, Richard, jun., 25 Northumberland street, Strand
1850. Cochrane, Alexander Brodie, the Heath, Stourbridge
1854. Cochrane, John, Woodside Iron Works, Dudley
1855. Cockayne, Octavius, South hill, Sydenham
1856. Cockrell, Rev. George C., Battersea rise
1853. Coe, John, Bank of England
1856. Cohen, Henry Louis, 5 South st., Finsbury sq.
1850.*Colby, Thomas, Harsham hall, St. Helen's, Lancashire
1846. Cole, Henry, C.B., Elm cottage, Shier, Guildford
1854. Cole, Thomas, 6 Castle street, Holborn
1852. Coleman, Alfred, South Fields, Wandsworth
1854. Colfox, William, B.A., Bridport, Dorset
1855. Colman, Jeremiah, Upper Clapton
1855. Colman, Jeremiah James, Ipswich road, Norwich
1853. Collins, Edward, 314 Oxford street
1854. Collins, Henry George, 22 Paternoster row
1853. Collins, William Whitaker, 15 Buckingham-street, Adelphi
1847. Colnaghi, Dominic, Pall Mall East
1853. Conybeare, John Charles, Kew green
1851. Cook, Arthur Bott, 6 Berkeley pl., Connaught sq.
1854. Cooke, John, 14 St. Swithin's lane, City, and South Shields
1843.*Cooke, William Fothergill, East Tytherley, near Stockbridge, Hants
1850. Cooper, Charles, 44 Pall Mall, Manchester
1850. Cooper, David, 5 Shoe lane
1853. Cooper, John Douglas, 8 New st., Spring gardens
1828.*Cooper, William D. Cooper, Toddington Manor, Dunstable, Bedfordshire
1856. Cooper, William, 21 St. John's villas, Upper Holloway
1855.*Copland, James, M.D., 5 Old Burlington street
1856. Corbet, Henry, 9 South Belgrave st., Belgrave sq.
1851. Corbett, Charles Joseph, 17 Gracechurch street
1854. Corbett, John, Stoke Works, Bromsgrove
1854. Cornwell, James, Loughborough park villa, Brixton
1856. Corsellis, Arthur Alexander, Wandsworth
1855. Costar, Francis Wright, 12 Frederick street, Gray's Inn road
1853. Cottam, Edward, 1 Lower Belgrave place, Pimlico
1818. Cottam, George, 2 Winsley street, Oxford street
1854. Cottam, George Hallen, 4 Chalcot villas, Adelaide road, Hampstead
1856. Cotterell, Thomas, 50 Eaton square
1855.*Coulson, William, 2 Frederick place, Old Jewry
1854. Coulthard, Joseph, Croft house, Brampton, Cumberland
1850. Countze, George Henry, 102 Long Acre
1853. Courtauld, George, 2 Carey lane, Goldsmiths' hall
1844. Courtney, William, jun., 54 Oxford ter., Hyde pk.
1848.*Coutts, Miss A. Burdett, 1 Stratton st., Piccadilly
1856. Coutts, J. S., 134 Upper Thames street
1845. Cowell, Henry Bridges, 4 Compton st., Ball's pond
1838. Cowley, John Christian, 14 Dorset sq., Regent's pk.
1854. Cox, Dr. Ths., Dulwich College Grammar School
1855. Cox, John, Glenusk, near Caerleon, Monmouthshire
1847. Crace, John Gregory, 14 Wigmore street, Cavendish square
1851. Crace, Henry Winfield, 19 Buckingham st., Strand
1854. Cracknell, Edward Charles, Royal Telegraph Company, Adelaide
1855. Cramp, Francis, 31 Upper Bedford pl., Russell sq.
1846. Crampton, Thomas Russell, 15 Buckingham street, Strand
1855.*Crawford, Robert Wigram, 71 Old Broad street
1817. Crawter, Henry, 5 Bedford row
1854. Creed, Henry, 33 Conduit street
1851. Crickitt, Robert Edward, 20 Bennet's hill, Doctor's Commons
1853. Croll, Alexander Angus, 28 Coleman street
1855. Crosbie, Arthur, 30 Westbourne park villas
1856. Crossley, Frank, M.P., 60 Eaton square
1852. Crossley, John, Elm wood, Halifax
1852. Crowfoot, W. J., M.D., Beccles
1853. Cruickshank, Patrick, 1 Norfolk cres., Oxford sq.
1843. Cubitt, William, M.P., Gray's inn road
1856. Cubley, William Harold, Newark-on-Trent
1852. Cullington, Daniel, jun., 2 Craven street, Strand
1846. Cundall, Joseph, 168 New Bond street
1851. Cundy, Samuel, 29a Lower Belgrave place, Pimlico
1853. Cunningham, H. D. P., R.N., Gosport, Hants
1845. Curling, Joseph, Herne hill, Dulwich
1840.*Cursetjee, Ardaseer, Bombay
1848. Curtis, Sir William, Bart., Caynham court, Ludlow
1853. Curtis, William, Alton, Hants
1854. Curtis, William Joseph, Mr. Winkley's, 23 Birchin lane
1848. Curzon, Hon. Edward Cecil, 1 Whitehall
1842. Cutler, Job, Spark Brook, Birmingham

1856. Daines, John Benjamin, 5 Little Argyle street, Regent street
1849. Dalton, William Henry, 28 Cockspur street
1856. Darbishire, Samuel Dukinfield, Pendyffryn, near Conway
1849. Darby, Abraham, Stoke court, near Slough
1853. Dargan, William, Harcourt street, Dublin
1856. Darlington, John, Shipley Hall, Bradford
1855. Davis, Alfred, 8 Manchester terrace, Kilburn
1852. Davis, Henry John, Newport, Monmouthshire.
1852. Davis, Horatio, Mount Beacon house, Bath
1851. Davis, Richards Francis, 22 St. Peter square, Hammersmith
1852. Davis, Richard Powell, Bedwelty house, Newport, Monmouthshire
1817.*Davidson, Thomas, 13 St. George's place, Knightsbridge
1843. Davison, Robert, 8 London street, City
1853. Dawbarn, George, Wisbech
1853. Dawbarn, Robert, Wisbech
1854. Dawson, G., M.A., Edgbaston, near Birmingham
1853. Dawson, John, Russell villas, Ampthill square, Hampstead road
1855. Day, Thomas, Stratton, Swindon, Wilts
1855. Day, William, 4 Campbell terrace, Bow road
1848. Day, William, Gate street, Lincoln's inn fields
1850. Dean, Arthur, 29 Norfolk road, St. John's wood
1854. Deane, John C., Garrick Club, King street, Covent garden
1852. Debary, Peter Francis, Privy Council Office, Whitehall
1851. De la Rue, Thomas, Drayton hall, Market Drayton
1847. De la Rue, Warren, F.R.S., 7 St. Mary's road, Canonbury
1854. De Vincenzi, Joseph, 61 Margaret st., Cavendish sq.
1850. Delamotte, Philip Henry, 28, Chepstow place, Bayswater
1852. Delepierre, Octave, LL.D., F.A.S., 18 Gloucester terrace, Hyde park
1851. Delolme, Henry, 48 Rathbone place
1856. Dell, William, 5 Manor terrace, Brixton

1851. De Mattos, William N., 6 Jeffrey sq., St. Mary Axe
1855. Dempsey, Henry William, 7, Pall Mall East
1852. Denison, Edmund Beckett, 42 Queen Anne street
1852. Denison, John Evelyn, M.P., 9 Stratton street, Piccadilly
1849. Dennis, John Charles, 122 Bishopsgate st. Within
1852.*Dent, Lancelot, 8 Fitzroy square
1856. Dent, Stanley, 34 Great Tower street
1855.*Dent, Wilkinson, 8 Fitzroy square
1855. Denton, J. Bailey, Stevenage, Herts
1813.*Dew, Dyer, 5 Parliament street
1850. Dick, Quintin, 20 Curzon street, May fair
1856. Dickens, Alfred Lamerte, General Board of Health, Whitehall
1849. Dickens, Charles, Tavistock house, Tavistock sq.
1853. Dickenson, Henry, Dale house, Coalbrookdale, near Wellington, Salop
1853. Dickenson, Joseph, M.D., Great George street, Liverpool
1855. Dickins, Thomas, Spring Vale Dye Works, Middleton, near Manchester
1855. Dickson, Archibald, Walnut-tree lodge, Lombard road, Battersea
1854. Dickson, James Hill, Patent Flax Works, Grove street, Deptford
1844. Dickson, Peter, F.R.G.S., 28 Upper Brook street
1856.*Dickson, Thomas, 3 St. James's place, Hampstead road
1856. Dickson, William, East Wickham, near Wetling, Kent
1845.*Dilke, Charles Wentworth, B.C.L., 76 Sloane st
1849. Dilke, C. W., 76 Sloane st
1849. Dillon, John, 106 Fore street, City
1856. Dixon, E. J. J., Gorsedda Quarries and Slate Works
1855. Dobson, Benj., Little Bolton, Lancashire
1852. Dodd, J. M., Ledbury house, Ledbury road, Notting hill
1853. Donkin, Thomas, Hanover park, Peckham
1850. Douglas, Capt. the Hon. Arthur, 13 Cockspur st., Pall Mall
1855. Douglas, Robert, A. 13 Hill street, Berkeley sq
1852. Doull, Alexander, 1 Morden terrace, Greenwich
1851. Doulton, Henry, 7 Stockwell villas, Clapham
1853.*Drax, John Samuel Wanley Sawbridge Erle, M.P., Chorborough park, Blandford, Dorset
1848. Dray, William, 46 King William street, London bridge
1851. Drew, Beriah, Streatham, Surrey
1849. Drew, George, Shrubbery cottage, Streatham
1849. Drew, George Henry, Hibernia chambers, London bridge
1853. Drew, John, 13 New Burlington street
1853. Drummond, Henry, M.P., F.R.S., Albury park, Guildford
1856. Drury, Mark Henry, Haley hill, Halifax
1852. Du Cane, Richard, 11 Bolton street, Piccadilly
1853. Duckworth, William, 38 Bryanston square
1855. Dudgeon, John William, 1 New Bank buildings, City
1856. Dudgeon, Patrick, Cargen, near Dumfries, N.B.
1851. Duer, Samuel, Ravensbourne park, Lewisham
1853. Duffield, William Ward, Chelmsford
1849. Duke, Sir James, Bart., M.P., 43 Portland place
1856. Dunn, Joseph Arnold, 13 Newington causeway
1856. Dunn, Thomas, Richmond hill, Sheffield
1856. Dunn, Thomas, Windsor bridge Iron Works, near Manchester
1856. Dupré, John, Plymouth
1852. Durnford, Frederick A., 44 Parliament street
1801.*Dutton, John, Sambrook court, Basinghall street
1847. Dutton, William C., 3 Upper Woburn place
1853. Dykes, David Stewart, Deptford pier
1851. Dyte, Henry, 6 King's bench walk

1854. Eady, George James, 15 Hatton garden, Holborn
1856. Eagland, Thomas, Bond street, Leeds
1851. Eagleton, Edward, Blackheath
1853. Eales, William, Haxby hall, Haxby, near York
1855. Eardley, Eardley Gideon Culling, Frognel, Torquay, Devon
1849. Eardley-Wilmot, Lieut.-Col., F. M., R.A., Woolwich
1846. Earle, Joseph, Palace Gardens, Bayswater
1850. Earle, William, Grove hill, Camberwell
1843. Easton, James, 25 Russell square
1847. Easton, James, jun., 79 King William street, City
1843. Easton, Percy S., 25 Russell square
1854.*Ebrington, Viscount, M.P., 17 Bruton street
1852. Edgar, William, F.R.S., 19 Argyle st., Regent st
1852. Edgeworth, T., Wrexham
1856. Edginton, Benjamin, Lavender hill, Wandsworth, Surrey
1846. Edwards, George, Rye, Sussex
1844. Edwards, John, Beachfield, Northian, Sussex
1853. Egerton, Edward Christopher, M.P., 13 Lowndes square, and Elvetham park, near Winchfield
1833. Ellesmere, Earl of, Bridgwater house, Pall Mall
1850. Elliott, Frederick H., Penryn lodge, Park village east, Regent's park
1853. Elliott, George Augustus, 13A Belgrave square
1848. Elliott, John H., 4 Martin's lane, Cannon street
1853. Elliott, Rev. William, 33 Great Coram street
1843. Ellis, James, M.D., Sudbrook park, Petersham, Surrey
1854. Ellis, Joseph, Bedford Hotel, Brighton
1853. Ellis, William, 6 Lancaster terrace, North gate, Regent's park
1855. Emmens, William, 5 Lothbury
1855. Enfield, Edward, 5 Oxford square, Hyde park
1848. Errington, J. Edward, 13 Duke st., Westminster
1849. Evans, Frederick John, Gas works, Horseferry rd., Westminster
1856. Evans, Frederick Moule, Whitefriars
1850. Evans, Jeremiah C., 33 King William street, City
1855. Evershed, Samuel, Arundel house, Clifton road, Brighton
1856. Evill, William, jun., Lyncombe villa, St. John's hill, Wandsworth
1852. Ewart, William, M.P., 6 Cambridge sq., Hyde pk
1853. Eykyn, Thomas, 12 Chepstow villas west, Westbourne grove
1855. Eyre, George Edward, Warren's, Lyndhurst, Hants

1847. Fairbairn, Peter, Wellington Foundry, Leeds
1843. Fairbairn, William, F.R.S., Manchester
1819.*Faraday, Michael, D.C.L., F.R.S., Royal Institution, Albemarle street
1854. Farr, William, M.D., 1 Melina place, St. John's wood
1856. Farrance, George John, 13 Upper Belgrave place, Pimlico
1853. Fasson, George, Crystal Palace, Sydenham
1856. Faudel, Henry, 38, 39 and 40 Newgate street, and 5 St. Andrew's-place, Regent's park
1856. Faulkener, William John, jun., 62 St. Martin's-le-Grand
1856. Fauntleroy, Charles, Tilgate house, Crawley, Sussex
1853. Fauntleroy, Robert Thomas, Pottersfields, Tooley street, Southwark
1826. Fenn, Joseph, 105 Newgate street
1852. Fenton, Roger, 2 Albert terrace, Albert road, Regent's park
1853. Fergus, John, M.P., Kircaldy
1853. Ferguson, Joseph, M.P., Reform Club
1854. Ferguson, William, 31 Torrington square
1854. Festing, Richard Grindal, 19A Queen square, Westminster
1816. Field, Joshua, F.R.S., Cheltenham pl., Lambeth
1851. Field, John, Dornden, near Tunbridge Wells
1854. Fielding, Edward, 56 Charlotte st., Portland pl
1853. Fife, Earl of, Duff house, Banff

1856. Finch, Frederick Cotton, M.D., West hill, Wandsworth
1854. Finch, Henry Young, 35 Cross street, Islington
1850. Fisher, Anthony Lax, M.D., 14 York place, Portman square
1856. Fisher, John, Masham, Yorkshire
1851. Fisher, Robert, 7 Sussex place, Canonbury
1854. Fitch, Joshua, G., M.A., 5 De Crespigny terrace, Denmark hill, Camberwell
1849. Fitz-Cook, Henry, 13 New Ormond street
1854. Fladgate, William Mark, 64 Eaton square
1851. Fletcher, Alexander Pearson, 1 Moorgate street
1856. Fletcher, Robert, 28 Parliament street
1854. Fogerty, William, 25 Catherine street, Limerick
1853. Foley, J. H. Hodgetts, M.P., Prestwood, Stourbridge
1854. Fontaine-Moreau, Peter Armand le Compte de, 4 South street, Finsbury
1842. Forbes, Henry, Bradford, Yorkshire
1852. Ford, Francis, 9 Milner street, Milner square
1851. Forman, Robert Henry, Ordnance Office, Pall Mall
1851. Forster, Percival William, 11 Manor road, Upper Holloway
1855. Foster, Edward, jun., 54 Pall Mall
1853. Foster, John, 16 Wigmore street
1845. Fothergill, Benjamin, Ducie place, Exchange, Manchester
1853. Fothergill, Mark, 204 Upper Thames street
1854. Fowke, Capt. Francis, R.E., Marlborough house, Pall Mall
1848. Fowler, John, 2 Queen's square pl., Westminster
1855. Fowler, John, jun., Chigwell row, Essex
1856.*Fowler, Robert Nicholas, 50 Cornhill
1843. Fox, Sir Charles, 8 New street, Spring gardens
1853. Fox, William Johnson, M.P., 3 Sussex place, Regent's park
1852. Francis, E. N., 2 Duke street, London bridge
1853. Franklin, Frank, 4 Orsett terrace, Westbourne terrace North
1850.*Franks, Augustus W., Oxford and Cambridge Club, Pall Mall
1843. Franks, George, 90 Blackfriars road
1855. Franklinski, Joseph Alexander, Claremont house, Pembroke villas, Bayswater
1853. Fraser, Alexander, Messrs. Truman's, Spitalfields
1856. Fraser, James Wm., Kensington palace gardens
1854. Fraser, Sir William Augustus, Bart., M.P., 88 St. James's street
1851. Freeman, John, Huddersfield
1853. Freeman, Joseph, Low Moor Iron Office, 22 Cannon street
1802.*Freeman, Stephen, Coventry
1853. Freer, Rev. Richard Lane, Archdeacon of Hereford
1852. French, Gilbert John, Bolton, Lancashire
1855. Frith, John Griffith, 13 Wimpole st., Cavendish sq
1849. Frodsham, Charles, 84 Strand
1845. Fry, Peter Wickens, 14 Montague st., Russell sq
1843.*Fuller, Francis, 29 Abingdon street, Westminster
1853. Fuller, George Leedham, 10 Park village west, Glo'ster gate, Regent's park
1817.*Fuller, J. G., 28 St. James's street
1853. Fussell, Alexander, 2 Oakley square, St. Pancras
1855. Fussell, Rev. James, G. C., Privy Council Office, Whitehall

1854. Gadsden, G. Arthur, 4 Rectory pl., Shacklewell
1854. Gadesden, Augustus William, Leigh house, Tooting, Surrey
1852. Gainsford, Charles Elliott, 18 Duke street, Westminster
1851. Galabin, Thomas, 13 Upper grove lane, Camberwell
1853. Galsworthy, John, Gresham Club, City
1856. Galton, Douglas, 12 Chester street, Grosvenor place
1846. Gardiner, James R., Duchy of Cornwall, Somerset house
1849. Gardiner, Thomas, Golden Cross Hotel, Charing cross
1819.*Garling, Henry, 27 Bedford row
1849. Garrard, Sebastian, Panton-street, Haymarket
1852. Garraway, Frederick, jun., Eamont villa, Boundary road, St. John's wood
1848. Garrett, George K., 9 Albion place, Blackfriars
1848. Garrett, Robert, 6 Northwick terrace, Maida vale
1856.*Gassiot, John Peter, F.R.S., 77 Mark lane
1849. Gaury, John, 80 Watling street
1850. George, John, Cadogan lodge, Abbey road, St. John's wood
1853. Gibb, Major C. J., R.E., Fort House, Gravesend
1816.*Gibbons, John, 345 Oxford-street
1845. Gibson, Edward, jun., Hull
1849. Gibson, Right Hon. Thomas Milner, M.P., 49 Wilton crescent
1855. Gibson, Thomas Field, F.G.S., 124 Westbourne terrace
1849.*Gilbart, James William, F.R.S., the London and Westminster Bank, Lothbury
1854. Gilbee, W. A., 4 South street, Finsbury
1855. Gilbert, Dr. Joseph Henry, Harpenden, Herts
1856. Gilmour, William Anthony, Bank of England
1852. Gill, Kennedy, Accrington
1842. Gillett, William S., 37 Upper Harley street
1856. Girdwood. John, 49 Pall Mall
1852. Glaisher, James, F.R.S., 13 Dartmouth terrace, Lewisham
1843. Glasscock, J. L., Bishop Stortford, Herts
1850. Glover, Joseph, 2 Roseberry villas, Tufnell park
1846. Glover, Thomas, 8 Upper Chadwell street, Myddelton square
1837.*Glynn, Joseph, F.R.S., 28 Westbourne park villas, Bayswater
1854. Goddard, Ebenezer, Ipswich
1852. Goddard, Samuel Palmer, Bath House, Longton, Staffordshire
1851. Goddard, Thomas, 8 King Edward street, Newgate street
1856. Goderich, Viscount, M.P., 1, Carlton gardens
1852. Godfrey, Joseph Silvester, 10 Gloucester terrace, Regent's park
1856. Godwin, George, F.R.S., 24 Alexander square, Brompton
1837.*Goldsmid, Aaron Asher, 8 Cavendish square
1844. Goldsmid, Baron, F.R.S., St. John's lodge, Regent's park
1836.*Goldsworthy, J. H., High street place, Stepney
1846. Gooch, John Viret, Great George st., Westminster
1847. Gooch, Joseph H., Crescent, Camberwell grove
1853. Goodeve, Thomas Minchin, King's College, Strand
1838. Goodwin, Charles, Lynn, Norfolk
1851. Goodwin, William Samuel, 33 Princes street, Leicester square
1853. Goolden, Charles, M.A., 7 South sq., Gray's inn
1855. Gordon, J. W., 10 New Palace yard, Westminster
1856. Gordon, Robert, Dover street, and Kemble house, Cirencester
1849. Gore, Henry, 25, York place, Leeds
1849. Gotto, Edward, 35A Great George st., Westminster
1855. Gowar, Stephen, Stratford, Essex
1854. Gowen, James Robert, F.R.G.S., F.G.S., 187A Piccadilly
1854. Gower, Hon. Frederick Leveson, M.P., 10 Stratton street, Piccadilly
1850. Graham, Peter, 37 Oxford street
1853. Graham, William, 74 Old Broad street
1848. Granville, the Earl, F.R.S., 16 Bruton street
1855. Granville, Walter, L. B., Engineer's Office, Brighton Railway, London bridge
1854. Gray, John, M.D., Middle Abbey street, Dublin
1855. Greaves, Charles, Waterworks, Old Ford
1853. Green, Stephen, Imperial Potteries, Lambeth

1856. Green, James Allen, 2 James street, Adelphi
1855. Green, Joseph Edwin, Osborne house, Myddelton square
1855. Green, Richard, Green's Dock, Blackwall
1854. Greenwell, George Clementson, Radstock, near Bath
1853. Gregg, S. G., 43 Rectory place, Woolwich
1854. Gregory, Isaac, Chorlton hall, near Manchester
1851. Gregory, Mark Henry, Wax Chandlers' hall, Gresham street
1853. Gregson, Samuel, M.P., 32 Upper Harley street
1853. Greig, Sir Hector, K.C.M. and G., 8 Ovington terrace, Brompton
1821.*Grenfell, Charles Pascoe, 38 Belgrave square
1856. Gretton, John, Burton-on-Trent
1849. Grey, Earl, 13 Carlton house terrace, and Howick hall, Alnwick
1851. Grey, Major-Gen. the Hon. C., Buckingham palace
1855. Grey, Jonathan, 12 Upper Finchley road, St. John's wood
1854. Griffiths, Frank, 8 Southampton street, Pentonville
1844. Grisbrook, William, Eastgate, Tenderden, Kent
1853. Grosvenor, Lord Robert, M.P., Moor park, Rickmansworth, Herts
1852. Grove, George, Crystal Palace, Sydenham
1856. Gundry, Joseph, Bridport
1848. Gunter, Thomas William, 7 and 8 Berkeley square
1848. Gurdon, William, Brantham, Manningtree
1854. Gurney, Samuel, 65 Lombard street
1853.*Gwilt, Alfred, 7 Union street, Southwark
1855. Gwynne, James Egleson Anderson, Essex wharf, Strand

1849. Habberfield, Richard, 31 Love lane, City
1853.*Hackblock, William, The Rock, Reigate
1851. Haden, Francis Seymour, 62 Sloane-street
1852. Haden, George, Trowbridge
1851. Haden, William, Dixon's green, Dudley
1849. Hailstone, Edward, Horton hall, Bradford, Yorkshire
1849. Hale, Warren S., 73 Queen street, City
1854. Hale, Rev. Edward, Eton College
1833. Hall, John, 3 Queen's gardens, Cleveland-square, Hyde park
1856. Hall, John Paxton, Oxford house, King's road, Chelsea
1856. Hall, Walter, Staining lane, Wood street
1850. Hall, Sparkes, 308 Regent street
1854. Hallett, George, 40 Stamford street, Blackfriars
1849. Hallowes, William, 32 Tavistock square
1851. Hambleton, Joseph, St. Marylebone Church Cottage
1855. Hamlyn, Joseph, Horrabridge factory, near Tavistock
1853. Hambro, Baron C. Joachim, 70 Old Broad st., City
1852. Hammond, William Parker, 9 Scot's yard, Great Bush lane
1855. Hammond, William Frederick, 14 Noel street, Soho
1856. Hanbury, Daniel, jun., Plough court, Lombard st.
1850. Hancock, Charles, 20 Tokenhouse yard
1855. Hancock, Charles Frederick, 39 Bruton street, Bond street
1848. Hancock, James Lyne, Goswell mews, Goswell road
1847. Hanhart, Michael, 64 Charlotte street, Rathbone place
1855. Hankey, Thomson, M.P., 45 Portland place
1856. Hanmer, Lieut. F. H., 14 St. James's square
1852. Harbin, George, Newton house, Yeovil
1849. Hardcastle, John, 22 Eastcheap
1848. Harding, Sir John Dorney, D.C.L., the College, Doctor's Commons
1853. Harding, John Thomas, 4 Cheapside
1851. Hardman, William, B.A., 3 Carey street, Lincoln's inn fields
1829. Hardwick, Philip, R.A., F.R.S., 21 Cavendish square
1855. Hardwicke, Earl of, 37 Portman square
1830.*Hardy, Lieut. Robert W., R.N., Sion Hill, Bath
1853. Harker, John William, 24 Upper Barnsbury street, Islington
1852. Harris, Thomas Phillips, 52 Great Russell street, Bloomsbury
1822.*Harrison, George, 16 Carlton house terrace
1825.*Harrison, Henry, 1 St. James's terrace, Maida hill west
1854. Harrison, Henry, Blackburn
1855. Harrison, John, Dock street, East Smithfield
1847. Harrison, John, Elm Lodge, Wandsworth
1849. Harrison, Robert, 19 Friday street, City
1850.*Harrison, William, Galligreaves house, Blackburn
1852. Harrison, William George Southey, 20 Whitehall place
1853. Harrowby, the Earl of, F.R.S., 39 Grosvenor square
1851. Hart, Charles, 54 Wych street, Strand
1852. Hart, George, Sydenham
1856. Hart, Thomas, Falmouth
1852. Hartop, Henry, Bamborough hall, Doncaster
1854. Harvey, Henry, Hatton garden
1856. Harvey, Capt. John, R.N., Harnden, Sandwich, Kent.
1852. Harvey, William, Barnsley
1836.*Hatchard, Rev. Thomas Goodwin, 187 Piccadilly
1855. Hatch, Rev. Henry John, Wandsworth
1849. Hawes, William, 17 Montague place, Russell square
1848. Hawkins, Benjamin Waterhouse, Belvidere road, Upper Norwood
1852. Hawkins, Major Rohde, Privy Council Office, Whitehall
1853.*Hawkshaw, John, F.R.S., 33 Great George street, Westminster
1856. Hawksworth, William, Avon Steel and Ironworks, Linlithgow
1851. Haynes, Francis Oliver, 13 New sq., Lincoln's inn
1851. Hayward, E. L., 79 Cornhill
1854. Headlam, Thomas Emerson, M.P. 10 New square, Lincoln's inn
1851. Heal, John Harris, Grass Farm house, Church end, Finchley, and Woburn lodge, Upper Woburn place
1850. Healey, Timothy, Manor house, Hampton park, Middlesex
1852.*Heane, Henry, Newport, Salop
1856. Healey, Edward Charles, Sidmouth lodge, Earl's court, Old Brompton
1852. Heathcote, John, M.P., Tiverton, and 5 Warwick street, Charing cross
1855. Heaton, John, Staveley, near Chesterfield
1829. Heberden, Thomas, M.D., 72 Park street, Grosvenor square
1838. Helbert, John Helbert, 60 Gloucester place, Portman square
1849. Henderson, Andrew, Wadham lodge, Ealing
1854. Henderson, John, New street, Spring gardens
1856. Henderson, Thomas W., 113 Westbourne terrace
1816. Hendrie, Robert, 12 Titchbourne street
1855. Henley, Thomas Frederick, Bromley, Middlesex
1856. Henley, Thomas L., 38 Church street, Croydon
1850. Henry, Thomas Hetherington, F.R.S., 44 Lincoln's inn fields
1852. Hensman, Henry, Bank of England
1849. Henson, Henry Henson, 38 Parliament street, Westminster
1855. Herbert, Rt. Hon. Sidney, M.P., Wilton house, Salisbury
1855. Herbert, John Maurice, Rocklands, near Ross, Herefordshire
1853.*Hereford, Dean of, Hereford
1856.*Herschell, Sir John F. W., Bart., F.R.S., Collingwood, Hawkhurst, Kent
1853. Hervey, the Rev. Lord Arthur, Bury St. Edmund's
1846. Heseltine, Samuel, jun., Stock Exchange
1856. Hess, Ralph, Liverpool

1848. Hetley, James Hicks, 35 Soho square
1847. Hewitt, Allen James, Old Hummums, Covent garden
1852. Heys, Henry, Barrhead, near Glasgow
1856. Heywood, Sharpe, Regent's park
1845. Hicks, John, Bolton le Moors
1851. Hicks, John, 6 South crescent, Bedford square
1856. Hicks, John, Manager's Office, Eastern Counties Railway, Bishopsgate
1851.*Hicks, Thomas, 9 Mincing lane
1847. Hickson, Samuel, Highgate
1846. Highton, Edward, Clarence villa, 5 Glo'ster road, Regent's park
1849. Hill, Charles, 25 Hyde park square
1855. Hill, Henry, 76, Bridge road, Lambeth
1856. Hill, Rev. James, M.A., Upper Nautical School, Greenwich
1853. Hills, Rev. George, M.A., Parsonage, Great Yarmouth
1852. Hindley, Charles, M.P., Dartmouth house, Westminster
1855. Hinks, John, Buckingham villas, Handsworth, Birmingham
1846. Hippisley, John, Stone Easton, near Bath
1852. Hitchin, James, Lincoln
1855. Hobbs, Alfred Charles, 97, Cheapside
1815. Hoblyn, Thomas, F.R.S., White Barns, near Buntingford, Herts
1851. Hocking, Samuel, Seville, Spain
1851. Hodgett, William James, Wordsley, near Stourbridge
1854. Hodgson, Kirkman Daniel, Sparrows Herne, Watford
1850. Hoffstaedt, Augustus J., 6 Albion place, Blackfriars bridge
1856. Hogg, Alexander, 10, Crown Office row, Temple
1854. Holland, Richard Leigh, 12 Pall Mall
1848. Holland, William, Mount street, Grosvenor square
1853. Hollier, Elliot, Dudley
1847. Hollins, Michael Daintree, Stoke-upon-Trent
1855. Holmes, Alfred William, Miltord, near Derby
1835. Holmes, Herbert Mountford, London road, Derby
1856. Holmes, James, Kidderminster
1846.*Holmes, James, 4 New Ormond street
1849. Holtzapffel, Mrs. Charles Vaux, 127 Long Acre
1855. Homersham, John, 7, Bengal place, New Kent rd.
1855. Homersham, Samuel Collett, 19 Buckingham street, Adelphi
1850. Hooper, George Norgate, 28 Haymarket
1853. Hooper, John, M.D., Buntingford, Essex
1849. Hope, Henry Thomas, 116 Piccadilly
1852. Hope, Thomas Radford, Litherland, near Liverpool
1856. Hopkinson, John, New North street, Finsbury
1856. Hopkinson, Jonathan, 40 Grosvenor place
1852. Hopwood, Charles H., 10 Montague place
1850. Horn, Thomas, Millbank row, Westminster
1849.*Horne, Henry, Berrylands, Surbiton, Kingston, Surrey
1853. Horner, Edward, Halstead
1855. Hornsby, John Harwood, Mechanics' Institution, Odiham
1842. Horton, John, 38 Devonshire st., Queen's square
1847. Hoskyns, Chandos Wren, Wraxhall Abbey, Warwick
1856. Houghton, George, 4 St. John's park villas, Haverstock hill
1848. Howard, Right Hon. Charles Wentworth G., M.P., 56 Park street, Grosvenor square
1849. Howard, Daniel, 22 Berners street, Oxford street
1854. Howard, Philip Henry, Corby castle, near Carlisle
1855. Howes, Frederick William, Bank buildings, Lower Brook street, Ipswich
1853. Howson, Rev. J. Saul, M.A., Principal of the Collegiate Institution, Liverpool
1847. Hoy, Henry Benjamin, 13 Roseberry villas, Tufnell park west, Kentish town
1853. Hubbard, Rev. George, Corfe castle, Dorset
1847. Hubert, Samuel Morton, East hill, Wandsworth
1855. Hucklebridge, James Marwood, 103, Upper Ebury street, Eaton square
1853. Hudson, J. W., Ph.D., Athenæum, Manchester
1851. Hughes, Edward, Royal Hospital, Greenwich
1825.*Hughes, William Hughes, 2 Inner Temple lane
1855. Hulett, David, 55 High Holborn
1848. Humby, Capt. George, 2 Aberdeen place, Maida hill
1853.*Hume, William Burnley, 18 Upper Harley street
1854. Hume, William, Wentworth Fitzwilliam, M.P., 20 Curzon street, Mayfair
1853. Humphreys, Edward, Deptford pier
1849. Hunt, James, 31 Parliament street
1856. Hunt, James, 8 New Burlington street
1852. Hunt, Robert, F.R.S., Museum of Practical Geology, Jermyn street
1856. Hunter, John Lawes, Wigan
1850. Huskisson, Henry Owen, 7 Judd place, Euston sq.
1853. Hutchinson, Rev. James, M.A., Berkhampstead
1856. Hutchison, John, 65, Mark lane
1853. Hutt, William, M.P., Gibside, near Gateshead, and Pulteney hotel, Albemarle street
1851. Hutton, W. C., 6 Newgate street
1852. Hutton, James, 46 Moorgate street
1854. Huxtable, Rev. Anthony, Sutton Waldron, Blandford, Dorsetshire
1856. Hyett, William Henry, F.R.S., Painswick, Gloucestershire.

1849.*Ibbetson, Capt. L. L. Boscawen, F.R.S., Clifton House, Brompton
1816.*Ilchester, the Earl of, 31 Burlington street
1850. Ionides, Alexander Constantine, Tulse hill, Surrey
1855. Isaac, John Raphael, 113 Chatham st., Liverpool
1849. Ivory, Thomas, 9 Ainslie place, Edinburgh
1851. Ivyleafe, James, 1 London villas, St. John's wood

1854. Jackson, James Barwick, 89 Bishopsgate st. Within
1850. Jackson, John, 50 Rathbone place
1853. Jackson, Ralph Ward, Greatham hall, West Hartlepool
1853.*Jackson, Samuel, 66 Red Lion street, Clerkenwell
1856. Jackson, William Henry, 315, Oxford street
1855. Jaffray, Richard, Gresham Club
1853. James, Jabez, 28A Broadwall, Stamford street
1849. Jeanes, John, 67 New Bond street
1848. Jee, Alfred Stanistreet, 6 John street, Adelphi
1851. Jee, Morland, 6 John street, Adelphi
1852. Jenings, Edmund John, 20 Upper Phillimore place, Kensington
1848. Jennens, T. H., jun., Birmingham
1848. Jennings, George, 29 Great Charlotte street, Blackfriars road
1856. Jennings, Richard, 21 Portland place
1853. Jenour, Harry James, 2 Field court, Gray's inn
1853. Jewitt, Llewellyn, Derby
1850. Jobson, John, Litchurch Works, Derby
1848. Jobson, Robert, Holly hall, near Dudley
1850. Johns, Henry, 8 Grange terrace, Brompton
1852. Johnson, Edmund Daniel, 9 Wilmington sq.
1849.*Johnson, Henry, 39 Crutched Friars, City
1853. Johnson, John Henry, 47 Lincoln's inn fields
1855. Johnson, Richard, Dale street, Manceester
1856. Johnston, James, jun., 1 Pond street, Hampstead
1844. Johnstone, James, Larchill, Moffat
1855. Johnstone, James R., M.P., 10 Wilton place
1856. Jones, Charles T., 1 Myddleton ter., Battersea
1853. Jones, Henry Bence, M.D., F.R.S., 31 Brook st.
1856. Jones, John, West hill, Wandsworth
1843. Jones, John, 338 Strand
1851. Jones, J. Carrington, 6 Albert villas, Fulham
1851. Jones, John Hodgson, 1 Poet's corner, Westminster
1847. Jones, Owen, 9 Argyle place, Regent street
1849. Jones, Richard Lambert, 49 Porchester terrace, Bayswater
1856. Jones, Thomas Stead, Minster place, Ely
1852. Jones, Rev. William Taylor, Romford

1855. Jonson, Arthur, 13 Hanover street, Long acre
1847. Jordan, Thomas Brown, Gold Crushing Works, Rotherhithe
1853. Joynt, William Lane, Limerick
1852. Judge, Jasper Augustus Frederick, 64A New Bond street
1830. Judkins, Eimer, Cannon row, Westminster

1856. Kaye, Horace, 71 Denbigh st., Warwick sq.
1856. Keats, Frederick, 23 Glo'ster gardens, Hyde park
1856. Keeling, Henry L., 4 Albany terrace, Regent's pk.
1855. Keener, John, Alfred town, near Ashford
1850. Keith, Daniel, 124 Wood street
1847. Keith, George, 36 Piccadilly
1852. Kell, William Ghrimes, 112 Westbourne ter.
1835.*Kemble, Horatio, Banstead park, Epsom, Surrey
1842.*Kemp, George Tawke, Rochdale
1835. Kendall, Henry Edward, 17 Suffolk street, Pall Mall East
1856. Kennard, Robert William, 67 Upper Thames st.
1855. Kennedy, Col. John Pitt, 54 Torrington square
1854. Kennedy, James, Belfast
1850. Kent, George, 329 Strand
1856. Kenworthy, James Lees, Noel villa, The Park, Ealing
1849. Kerr, Mrs. Alexander, 67 Grosvenor street
1854. Kershaw, Joseph Hughes, 9 Park terrace, Brixton road, Surrey
1854. King, Alfred, C.E., Gas Works, Liverpool
1850. Kingsford, Charles, 26 Mark lane
1849. Kingsford, Edward, London and Westminster Bank, Southwark
1851. Kingsford, Thomas, 26 Mark lane
1854. Kingsley, Rev. William Towler, B.D., Sidney College, Cambridge
1855. Kirtley, Matthew, The Grove, Derby
1854. Klein, William, Earlswood, Reigate
1848. Knight, Charles, 90 Fleet street
1851. Knight, George, 40 Foster lane, City
1853. Knight, J. Jordan, 37 Camden road villas

1856. Labalmondiere, George, 22 Whitehall place
1852. Lacy, Henry Charles, Richmond, Surrey
1852.*Laffan, Capt. Robert Michael, R.E., M.P., 11 James street, Pimlico
1831. Laing, David Gordon, 2 Villiers street, Strand
1850. Lambert, Thomas, Short street, New cut
1850. Lancaster, Charles William, 151 New Bond st.
1852. Lance, John Henry, the Holmwood, Dorking
1831.*Langdon, Augustus, 38 Morland sq., Notting hill
1855. Langworthy, Edward Ryley, Victoria park, Manchester
1825.*Lansdowne, the Marquis of, K.G., D.C.L., F.R.S., 54 Berkeley square
1856. Langston, James Haughton, M.P., 143 Piccadilly, and Sarsden house, Chipping Norton
1847. Lapworth, Alfred, 22 Old Bond street
1855. Lark, James, Cement Works, Nine Elms
1854. Larnach, Donald, 37 Cannon street
1854. Latham, Robert Gordon, M.D., F.R.S., 29 Upper Southwick street, Hyde park
1851. Lavanchy, John Robert, 6 New Burlington st.
1854. Lawes, John Bennet, F.R.S., Rothamstead, St. Alban's
1849. Lawrence, Frederick, 94 Westbourne terrace
1854. Lawrie, James, 1 Newman's court, Cornhill
1848. Laws, Admiral John Milligen, Marchfield house, Binfield, Berks
1856. Lawson, John, 34 Parliament street
1856. Leaf, Charles John, Old Change
1824.*Leaf, William, 39 Old Change
1848. Leake, Frederick, 9 Warwick street, Regent street
1838.*Le Couteur, Col. William Martin, F.R.S., Bellevue, Jersey
1848. Lee, Charles, 20 Golden square
1817.*Lee, John, LL.D., F.R.S., Doctor's Commons
1844.*Lee, Stephen Henry, 12 Finsbury place
1851. Lee, Thomas, 5 George yard, Lombard street
1849. Leeks, Edward Frederick, 10 St. George's road, Belgravia South
1854. Leeman, George, York
1856. Lefevre, George Shaw, 6 Old Palace yard
1855. Leighton, George Cargill, 4 Red Lion sq., Holborn
1851.*Leighton, John, jun., F.S.A., 12 Ormond terrace, Regent's park
1848. Leman, Francis H., 15 Threadneedle street
1852. Lemon, Sir Charles, Bart., M.P., F.R.S., 46 Charles street, Berkeley square
1856. Leonard, James, 2 Salisbury street, Strand
1851. Leonard, Samuel William, 82 Upper Stamford st.
1855. Lermit, Rev. Gerald, Dedham Grammar School, near Colchester
1856. Lester, Lester, 45 St. James's street
1801.*Levien, Solomon, New South Wales
1854. Levi, Leone, F.S.S., 12 The College, Doctor's Commons
1856. Levick, Frederick, Cwm Celyn and Blaina Iron Works, Monmouthshire
1853. Levy, Moses, 2 Aldgate
1855. Lewellin, Henry, 22 Chancery lane
1856. Lewis, Arthur J., 195 Regent street
1855. Lewis, Stephen, Roehampton
1855. Lewis, Waller, M.D., General Post Office
1843. Lewis, Stephen, jun., 195 Regent street
1792.*Lewis, Thomas
1856. Liardet, Capt. Francis, R.N., Royal Hospital, Greenwich
1856. Libbis, George, 10 Egremont place, King's cross
1851. Liddiard, William, Friday street
1856. Lindsay, William Schaw, M.P., 17 Portland place, and 8 Austin-friars
1849. Lindley, Nathaniel, Acton green, Turnham green
1844. Lindley, William, 8 Adelphi terrace
1852. Lingen, Ralph Robert Wheeler, Privy Council Office, Whitehall
1856. Lister, John, 4 Trafalgar square
1834.*Lister, William, 15 Manchester buildings, Westminster
1852. Litchfield, John, Epperstone cottage, near Southwell, Nottingham
1856. Llewellyn, J. D., Penllegare, Llanelly
1852. Lloyd, Sampson, Wednesbury
1848. Locke, Joseph, M.P., F.R.S., 13 Duke street, Westminster
1854. Lockett, Joseph, Fennell street, Manchester
1854. Lockhart, A. Elliott, M.P., Barthwickbrae, Hawick, N.B.
1852. Lockwood, H. F., Nunwood, Rawdon, near Leeds
1851. Long, Charles Albert, 153 Fleet st.
1856. Longbottom, Abram, 41 Moorgate street
1855. Longbottom, John, Leeds
1852. Longmaid, William, Victoria cottage, Stoke Newington
1855. Longstaff, G. Dixon, M.D., Wandsworth
1825. Lonsdale, The Earl of, F.R.S., 15 Carlton house terrace
1852. Loseby, Edward Thomas, 5 Fitzroy ter., Kentish town
1824.*Lott, Thomas, 43 Bow lane, Cheapside
1851. Louch, William Stevens, 12 Buckingham street, Adelphi
1850. Lovegrove, James Samuel, Brunswick hotel, Blackwall
1850. Lovegrove, Samuel, 2 Upper St. Germain's terrace, Blackheath
1851. Lovejoy, William, Crouch hill, Hornsey
1855. Lovelock, Samuel, 7 Dowgate hill
1855. Low, William, Lloftwen, near Wrexham
1818. Low, Robert, 330 Strand
1820. Lowe, George, F.R.S., 39 Finsbury circus
1847. Lowry, Joseph Wilson, 45 Robert street, Hampstead road

1852. Lucey, W. W., Marlborough
1850. Lucy, William, Birmingham
1845. Lund, Henry, 3 Hare court, Temple
1855. Lycett, Francis, 97 Wood street, City
1856. Lye, John Gaunt. 6 Lancaster place, Strand
1856. Lyte, F. Maxwell, Norton Manor, near Taunton, Somerset

1851. Macdonald, John Cameron, Printing house sq., Blackfriars
1855. MacGregor, James, M.P., May place, Crayford, Kent
1854. Mackenzie, Rev. Charles, M.A., 15 Gloucester terrace, Hyde park
1852. Mackie, Samuel James, Folkstone
1855. Mackrell, William Thomas, Southfields, Wandsworth
1855. Macnaught, Archibald, 26 Grafton square, Clapham common
1852. Macready, William Charles, Sherborne, Dorset
1820.*Magrath, Edward, Athenæum Club, Pall Mall
1838. Mair, George, 41 Bedford place, Russell square
1855. Mair, Hugh, Friday street, City
1856. Major, Rev. J. R., 40 Bloomsbury square
1854. Malcolmson, James (care of Rev. A. L. Simpson), Forres, N.B.
1853. Manby, Charles, F.R.S., 25 Great George street, Westminster
1854.*Manchester, the Bishop of, F.R.S., Manchester
1855. Mann, James Hargreave, Twickenham
1854. Manning, Samuel, Union place, New road
1852. Mansell, Edward, 20 Halkin street west, Belgrave square
1820.*Manvers, Earl, 13 Portman square
1856. Marchant, W., Regent circus, Oxford street, and Ashford
1856. Maris, Andrew, 15 Upper Woburn place
1843. Marriott, Jeremiah, Dewsbury, Yorkshire
1850. Marshall, Edward Smith, 31 John street, Tottenham court road
1852. Marshall, Matthew, Bank of England
1853. Martin, Edward Waller, Guildford
1852, Martin, Horace, Battle
1856. Marryat, Joseph, Maes-y-dderwen, near Swansea
1855. Martin, Rear-Admiral W. Fanshawe, H. M. dockyard, Portsmouth
1852. Martin, Rev. Samuel, 2 Middleton villas, Camden road, Holloway
1847. Martin, Samuel Dickinson, Flower bank, Burley, near Leeds
1852. Martin, Thomas, Reigate
1853. Martineau, David, South road, Clapham park
1854. Mason, George, Darlington
1856. Masterman, William Stanley, 3 Clifford's inn, and Wellesley court, Croydon
1855. Masters, James, 12 Garlick hill, City
1851. Matthew, James, 105 Upper Thames street
1816. Matthews, William, 367 Strand
1852.*Maudslay, Henry, 4 Cheltenham place, Westminster road
1853. Maudslay, Joseph, 5 Cheltenham place, Westminster road
1815. Maudslay, Thomas, Cheltenham place, Westminster road
1848. Maw, Solomon, 11 Aldersgate street
1824. Mawley, Henry, 20 Gower-street
1855. Maxtone, James, Coltoquhay, Perth, N.B.
1856. Maxwell, Sir John, Bart., Polloc, near Glasgow
1856. Mayhew, Charles, 6 Chester terrace, Regent's park
1849. May, Charles, F.R.S., 3 Great George street, Westminster
1856. May, Samuel, 15 Upper Charles street, Northampton square
1853. M'Alpine, William, Spring vale, Hammersmith
1844. M'Clean, John Robinson, 17 Great George street, Westminster
1853. M'Cormick, William, 2 Park square west, Regent's park
1854. M'Douall, Col. James, Logan, Stranraer, N.B.
1849. M'Dougall, Alexander, 44 Parliament street, Westminster
1855. M'Gregor, Alexander, 23 Upper Wimpole street
1855. M'Gregor, Peter, Manchester
1855. M'Kay, Hugh, 447 Strand
1855. M'Keller, Andrew Duncan, Grove house, Battersea
1856. McKie, H., Carlisle
1854. M'Lauchlan, Frederick Holt, 2 Printing house sq.
1855. M'Murray, William, 39 Queen street, Cheapside
1850. Mead, Charles Roper, 3 Langdale road, Hill street, Peckham
1850. Mechi, John Joseph, Tiptree hall, Kelvedon
1855. Medlock, Henry, 20 Great Marlborough street
1854. Mee, John, East Retford
1845. Meeking, Charles, Holborn hill
1855. Mein, Robert, Thorney abbey, Cambridgeshire
1839. Meinertzhagen, Daniel, 10 Moorgate street
1855. Melrose, James, 78 Hatton garden
1853. Merchant, Thomas, Derby
1825.*Merle, William Henry, 20 Prince's terrace, Hyde park
1855. Merrifield, Charles Watkins, Privy Council office, Whitehall
1848. Messenger, Samuel, Birmingham
1856. Metford, William Ellis, Flook house, Taunton, Somersetshire
1850. Middleton, Richard, 18 Albion grove, Barnsbury pk
1852. Miles, Philip W. S., Kingsweston, Bristol
1851. Millman, the Rev. Henry H., Deanery, St. Paul's
1856. Miller, Capt. Thomas, R.N., Army and Navy Club
1851. Miller, Taverner John, 7 Millbank street, Westminster
1852. Milligan, Robert, M.P., Rawdon, near Leeds
1856. Milligan, Robert, Harden mills, Bingley, near Bradford
1853. Milner, Edward, Oxford house, Annerley road, Upper Norwood
1855. Milton, Alfred, 23 Tichborne street, Haymarket
1846. Minton, Herbert, Stoke-upon-Trent
1852. Mitchell, Rev. Muirhead, 15 St. James's square
1856. Mitchell, Rev. W., St. Bartholomew's hospital
1856. Mitchell, William, 54 Gracechurch street
1847. M'Neill, William, Glenwhr house, Woolwich
1847. Moffatt, George, M.P., 103 Eaton square
1852. Mogford, Henry, Fine Art Department, Cyrstal Palace
1855. Mondel, Joseph, Tower buildings, Liverpool
1851. Monteagle, Lord, F.R.S., 7 Park st., Westminster
1852. Montefiore, Nathaniel, 36 Hyde park gardens
1853. Montizon, Count de, 2 Cranley place, Onslow sq.
1852. Montgomery, James, Brentford
1854. Moody, Rev. Clement, M.A., Vicarage, Newcastle-on-Tyne
1856. Moore, E. W., Coleshill, Highworth, Berkshire
1810.*Moore, George, F.R.S., 64 Lincoln's inn fields
1847. Moore, John, 105 Goswell road
1854. Moore, Robert, R.R., Glebe house, Cook's grounds, Chelsea
1829. Morgan, Charles Octavius Swinnerton, M.P., F.R.S., 9 Pall Mall
1852. Morgan, Henry, Paymaster General's office, Whitehall
1843. Morgan, Joseph, Cheetham hill, near Manchester
1852. Moriarty, Edward A., 20 Spring gardens
1820.*Morison, James, 57 Upper Harley street
1851.*Morley, John, Upper Clapton
1854. Morley, Samuel, Craven lodge, Stamford hill
1848. Morrell, G. F., 149 Fleet street
1852. Morris, David, M.P., 8 St. James's place
1852. Morrison, James, Commercial Bank, Stirling
1822. Morson, Thomas N. R., 38 Queen's square, Bloomsbury

1843. Mortimer, John, 14 Hanover square
1848. Mortlock, William, 18 Regent street
1850. Morton, Francis, James street, Liverpool
1847. Morton, John C., 5 Upper Wellington st., Strand
1856. Muir, William, Britannia works, Strangeways, Manchester
1849.*Mulready, William, R.A., 1 Linden grove, Bayswater
1855. Muncaster, Lord, Walter priory, York
1849. Munday, George, 26½ Abchurch lane, City
1844. Murchison, J. H., Prospect villa, Surbiton hill, Surbiton, Surrey
1853. Murray, Andrew, Royal Dockyard, Portsmouth
1854. Murray, James, 30 Cornhill
1851. Murray, John, 11 Great Queen street, Westminster
1848. Musgrave, Thomas, 6 Gordon square

1853. Nairne, Robert, M.D., 44 Charles street, Berkeley square
1854. Nash, Eliezer, 30 Coppice row, Clerkenwell
1850. Nash, Swan, 253 Oxford street
1856. Neale, Robert, 3 Canning place, Kensington
1850. Nesbit, John C., 37 Lower Kennington lane
1853. Nevin, John, Carshield, West Allendale, Haydon bridge
1853. Newall, Henry, Rochdale
1845. Newall, Robert S., Gateshead
1853.*Newcastle, the Duke of, P.C., 17 Portman square
1854. Newmarch, George Frederick, Cirencester
1852. Newton, Charles Henry, 92 Camden road villas
1853. Newton, Henry Charles, 46 Camden road villas
1842. Newton, William Edward, 66 Chancery lane
1856. Niblett, Alfred Newsom, Elizabeth house, Hampstead
1851. Nicholay, John Augustus, 82 Oxford street
1854. Nicholon, G. T., Waverley Abbey, Farnham
1854. Nichols, George Alexander, 8 St. George's road, Eccleston square
1849. Nicholl, Donald, A 1 Albany
1851. Nicholl, Henry James, 14 Hyde park gate, Kensington
1854. Nightingale, W., Embley park, near Romsey
1855. Nind, Philip, 30 Leicester square
1852. Noble, Matthew, Berkeley chambers, 13 Bruton st
1853. Noldwritt, John Spencer, 11 Albany road, Camberwell
1853.*Norris, Rev. John Pilkington, Privy Council Office, Whitehall
1854. North, Frederick, M.P., Lodge, Hastings, and 3 Westminster terrace, Victoria street
1856. North, Robert Samuel, Park street, Derby
1838. Northesk, the Earl of, Winchester, Hants
1853. Northouse, W. S., 23 Great Tower street
1814. Northumberland, the Duke of, K.G., P.C., F.R.S., Northumberland house, Charing cross, and Alnwick castle, Northumberland
1855. Norton, John, Rosherville hotel, Gravesend
1852. Norway, William King, Reform Club, Pall Mall
1851. Nyren, John William, 5 Angel place, Edmonton

1853. Oakes, Henry Porteus, M.P., Oxford and Cambridge Club, Pall Mall
1851. Oakley, J. Jeffryes, 182 Piccadilly
1852. Oastler, Jonas, Valentine terrace, Blackheath
1856. Obbard, Robert, Paragon, Blackheath
1855. O'Beirne, James Lyster, 60, Piccadilly
1856. Ohren, Magnus, Bell green, Lower Sydenham
1853.*Oldfield, D. 13 Bouverie street, Fleet sreet
1852. Oliveira, Benjamin, M.P., F.R.S., 8 Upper Hyde park street
1855. Oliver, Joseph, 286 Wapping
1853. Ord, Augustus W., Kingston-on-Thames
1856. O'Reilly, Montague Frederick, 4 Brand street, Greenwich
1821. Orkney, the Earl of, 3 Ennismore place, Prince's gate, Hyde park
1856. Orr, Capt. Andrew S., R.A., Woolwich
1837.*Osborne, Samuel, jun., 19 Manor terrace, Brixton
1855. Ottley, George, 1 Stone's end, Borough
1848.*Overstone, Lord, 2 Carlton gardens
1851. Owen, Lieut.-Colonel Henry Cunliffe, R.E., C.B., 7 Osnaburg terrace, Regent's park
1856. Owen, Rev. John Butterworth, Royal Polytechnic Institution, Regent street
1856.*Owen, Richard, F.R.S., Natural History Department, British Museum
1855. Oxley, J. Stewart, 38 Mincing lane, City
1854. Oxley, John Timothy, Clapham common

1852. Packe, Charles William, M.P., 7 Richmond terrace, Whitehall
1855. Paden, Stephen, Epsom
1848. Page, Thomas, 2, Middle Scotland yard
1853. Paget, Capt. Leopold Grimston, R.A., Northampton
1829. Palmer, Philip, 118 St. Martin's lane
1826. Palmer, William Henry, 24 Bedford row
1852. Panton, James, Wareham
1854. Parfit, George John, City Surveyor's office, Bath
1856. Parkes, Samuel Hickling, 5. St. Mary's row, Birmingham
1849. Parry, Thomas Gambia, Highnam court, Gloucester
1848. Parry, Thomas, Castle Bar hill, Ealing.
1852. Parry, Thomas, Sleaford
1853. Parsons, Perceval M., 6 Duke street, Adelphi
1852.*Pasley, Lieut.-Gen. Sir Charles William, K.C.B., F.R.S., 12 Norfolk crescent, Hyde park
1852. Pasley, Lieut. C., R.E., Melbourne, S. Australia
1852. Patten, John Wilson, M.P., 24 Hill st., May fair
1850. Patterson, John, 104, Wood street, Cheapside.
1854. Paul, Benjamin H., 1 Torrington-st., Russell sq
1851.*Paxton, Sir Joseph, M.P., Rockhills, Sydenham
1849. Payne, Edward John, 2 Bennet's hill, Birmingham
1854. Payne, George, Walnut-tree lodge, Lombard road, Battersea
1854. Payne, George Josiah, 328 Regent street
1810.*Paynter, John, 64 Coleman street
1852. Pearce, Alfred B., 23 Ludgate hill
1853. Peel, Sir R., Bart., M.P., 22 Princes gate, Hyde park
1847. Pellatt, Apsley, M.P., Holland street, Blackfriars
1853. Penn, John, Greenwich
1853. Pepper, John Henry, 8 Regent's park terrace
1821.*Pepys, John, 8 Lower Berkeley street
1811. Pepys, William Hasledine, F.R.S., 11 Earl's terrace, Kensington
1849. Perkins, Ainger March, 6 Francis street, Gray's inn road
1847. Perry, George, Charter house
1855. Perry, John George, 12 Westbourne street, Hyde park gardens
1850. Peters, John W., 124 Piccadilly
1852.*Petit, Rev. John L., 9 New square, Lincoln's inn
1854. Peto, Sir Samuel Morton, Bart., 9 Great George street, Westminster
1855. Phillips, Sir George R., Bart., 12 Hill street, Berkeley square
1847. Phillips, Henry Wyndham, 8 George street, Hanover square
1853. Phillips, Robert A., Cockspur street, Haymarket
1854. Phillips, Sir Thomas. F.G.S., 11 King's Bench walk, Temple
1848. Phillips, W. P., 359 Oxford street
1848. Phipps, Col. the Hon. Charles Beaumont, Windsor Castle
1852. Pickstone, William, Radcliffe bridge, Lancashire
1849. Pierce, William, 5 Jermyn street
1853. Pilkington, James, M.P., Blackburn
1831. Pilgrim, C. H., Gosden, Stratford, near Guildford
1856. Pinches, Conrad H., Clarendon house, Kennington road
1852. Pinches, Thomas Ryan, 27 Oxenden street
1853. Pinkney, Robert, 26 Long Acre
1850. Piper, Henry Hunt, East Dulwich, Surrey

1854. Pitman, Edward John T., Bristol Road School, Birmingham
1855. Pitman, John Talbot, 67 Gracechurch street
1854. Pitts, Samuel, 14 Catherine street, Strand
1852. Platt, James, Hartford Works, Oldham
1846. Platt, John, 22 Park square east, Regent's park
1850. Playfair, Dr. Lyon, C.B., F.R.S., 16 Devonshire terrace, Notting hill gate
1849. Pledge, Edward Varney, 311 Cheapside, Birmingham
1854. Pocock, George Pearce, Log hall, Bow, Middlesex
1853. Pollock, Henry, 28 George street, Hanover square
1851. Pomeroy, William W., 127 Long Acre
1850. Portal, Wyndham S., Malshanger, Basingstoke, Hants
1856. Porter, John Thomas Brown, Lincoln
1852. Portman, Lord, Bryanstone, Blandford, Dorsetshire
1849. Powell, Arthur, Glass Works, Whitefriars
1854. Powell, Francis, 33 Gloucester cres., Regent's pk.
1849. Powell, Nathaniel, Glass Works, Whitefriars
1853. Power, David, Cloisters, Temple
1847. Powles, John Diston, 46 Wimpole street
1856. Powys, the Hon. Major Henry Lyttelton, Trafalgar square, Brompton
1853. Preller, Charles Augustus, 5 Aberdeen villas, Blackheath
1854.*Prescott, W. G., F.G.S., 8 Rutland gate
1855. Preston, Francis, Ardwicke Spindle Works, Manchester
1855. Prevost, George, Gresham house, Old Broad st.
1855. Price, George, Cleveland street, Wolverhampton
1848. Prinsep, William Haldimand, 8 Hyde park place west, Hyde park
1822. Prior, Edward, 48 York terrace, Regent's park
1854. Prior, William Squire, 23 Broad street bldgs. City
1855. Pritchard, George, Broseley, Shropshire
1855. Pritchard, John, M.P., 33 Eaton place
1845. Proctor, John, 34 Highbury place, Islington
1856. Proctor, Thomas, Wall's court, near Bristol
1819.*Provis, William Alexander, The Grange, near Ellesmere, Salop
1854. Prower, Rev. Canon, Purton Vicarage, near Swindon
1854. Pulman, James Heard, House of Lords
1852. Purvis, Prior, M.D., 5 Lansdowne place, Blackheath
1856. Pye, George, the Grey Friars' Works, Ipswich

1856. Radcliff, Joshua, Balderstone hall, Rochdale
1822.*Radcliff, Sir Joseph, Bart., Rudding park, Wetherby, Yorkshire
1856.*Radford, William T., M.D., Sidmount, Sidmouth
1815. Radnor, the Earl of, F.R.S., Coleshill house, Highworth
1853. Rae, William Fraser, 2 George street, Edinburgh
1855. Rammell, Thomas Webster, F.G.S., 13 Bruton st.
1854. Ramsbottom, John, London and North Western Railway, Longsight Works, near Manchester
1854.*Ramsden, Sir John William, Bart., M.P., 6 Upper Brook street
1817. Ramsden, Richard, 7 Brook street, Holborn
1856. Ransford, Henry, Huron lodge, Tregunter road, Brompton
1856. Ransome, James Allen, Ipswich
1833. Rastrick, John Urpeth, F.R.S., Sayes court, near Chertsey, Surrey
1856. Ratcliff, Charles, Wyddrington, near Birmingham
1855. Rawlinson, Robert, 34 Parliament street
1855. Rawson, John, Ashfield place, Bradford, Yorkshire
1842. Rea, Edward, 115 Wardour street
1852. Reade, Alfred, Datchet
1853. Readwin, Thomas Allison, 8 York place, Portman square
1850. Redgrave, Alexander, the Home Office, Whitehall
1847. Redgrave, Samuel, Gifford lodge, Twickenham common
1851. Redpath, Christopher James, St. John's villas, Haverstock hill, Hampstead
1855.*Redpath, Leopold, 27 Chester terrace, Regent's park
1852. Reeve, Henry, Privy Council Office, Whitehall
1851. Reeves, Henry, 113 Cheapside, City
1824. Reeves, John Reeves, F.R.S., King's Arms yard, Moorgate street
1850. Reid, James, 10 Lawrence lane, City
1847. Reid, William, 5 Laura place, Clapham
1852. Remnant, Samuel James, Reform Club, Pall Mall
1843. Rendel, James Meadows, F.R.S., 8 Great George street, Westminster
1848. Rennie, Sir John, F.R.S., 5A New street, Spring gardens
1852. Renshaw, George P., Crow Hotel, George square, Glasgow
1823.*Reveley, George Johnson, 17 Queen sq. Bloomsbury
1821.*Reveley, Henry Willey, Sunny hill, Parkston, Poole, Dorset
1853. Reynolds, John S., Hampstead
1853. Reynolds, Capt. H., Twickenham green
1846. Ricardo, Moses, Brighton
1853. Ricardo, Osman, M.P., 71 Eaton place
1855. Ricardo, Samson, M.P., 50 Grosvenor place
1855. Rice, William, Weston Favill, near Northampton
1853. Richards, Theophilus, Birmingham
1847. Richardson, Benjamin, Wordsley, near Stourbridge
1855. Richardson, Benjamin Ward, M.D., 12 Hinde street, Manchester square
1847. Richardson, John, Wordsley, near Stourbridge
1855. Ricketts, Frederick, Surbiton Hill, Surrey
1853. Rideout, William J., Farnworth, near Bolton
1853. Ridgway, John, Cauldron place, Staffordshire Potteries
1853.*Rigg, Rev. Arthur, Chester
1854. Robartes, James Thomas Agar, M.P., Lanhydrock house, Bodmin
1855. Roberts, Mrs. Elliot, Twickenham
1847. Roberts, David, R.A., 7 Fitzroy street
1852.*Roberts, Henry, Wykeham lodge, near Hersham, Esher
1855. Roberts, Henry, 20 Exeter Hall, Strand
1850. Roberts, John, Upnor lodge, near Rochester
1852. Roberts, William (Brown, Lennox, and Co.) Millwall, Poplar
1856 Robertson, Andrew, 15, Barnsbury park villas, Islington
1856. Robertson, Robert William, Holland st. Blackfriars
1854. Robinson, Charles Burt, The Shrubbery, Leicester
1853. Robinson, Frederick, Carlton Chambers, 12 Regent street
1854. Robinson, Henry Oliver, 43 Moorgate street
1849. Robinson, Joseph, Berkhampstead
1850.*Robinson, Lieut. W. F., R.N., Sky hill, Queenstown, Cork
1849. Rock, James, jun., 6 Stratford place, Hastings
1855. Roden, William Sergeant, Shelton Iron Works, Stoke-upon-Trent
1853. Roddam, Jonathan, Newhouse, St. John's Chapel, Weardale
1833. Rofe, John, Winkley-square, Preston
1855. Rogers, Ebenezer, Abercarn, South Wales
1816.*Roget, Peter Mark, M.D., F.R.S., 18 Upper Bedford place
1855. Rose, James Anderson, 11 Salisbury street, Strand, and Wandsworth common
1855. Ross, Rev. A. J., 15 Hanover crescent, Brighton
1848. Rose, William, Newcastle street, Strand
1850. Roskell, John, jun., Church street, Liverpool
1833. Ross, Andrew, 2 Featherstone buildings, Holborn
1835. Ross, Sir William Charles, R.A., 38 Fitzroy square
1850. Rothschild, Sir Anthony, Bart., Grosvenor house, Grosvenor place
1856. Rough, Robert, 5 Ludgate hill
1854. Roundell, Rev. Henry, Buckingham
1854. Rowden, Rev. G. C., D.C.L., Temple grove, East Sheen
1852. Rowe, Richard Reynolds, Cambridge

1855. Rowney, Frederic, 10 Percy street, Fitzroy square
1850. Royle, John Forbes, M.D., F.R.S., Heathfield lodge, Acton
1853. Ruff, Edward, Hind court, Fleet street
1856. Rusby, William John, Water lane, Tower st., City
1854.*Rushout, Col. the Hon. George, M.P., 10 Bolton street, Piccadilly
1854. Rushton, Thomas George Alfred, 50 Portman pl., Maida hill
1853. Rushton, Thomas Lever, Bolton, Lancashire
1854. Russell, Lady Frankland, Chequer's court, Tring, Herts
1853. Russell, Geo. Fitzjames, 29 Devonshire street, Queen's square, Bloomsbury
1846. Russell, John James, 81 Upper Ground street, Blackfriars
1849.*Russell, John Scott, F.R.S., 37 Great George st., Westminster
1854. Ruston, Rev. James, M.A., Fretwell Vicarage, Oxon
1849. Rutter, J. O. N., Black Rock, Brighton
1855. Rymer, Samuel Lee, Croydon, Surrey

1851. Saddington, Alderman J., Gravesend, Kent
1854. Sadler, Charles James, Oxford
1855. St. André, Jules Lechevalier, 23 King William street, Strand
1853.*St. Davids, the Bishop of, The Palace, Carmarthen
1854. Salisbury, The Dean of, The Close, Salisbury
1855. Salmon, John, 37 Cannon street, City.
1849. Salomons, Aaron, 22 Cambridge square, Hyde pk.
1849.*Salomons, David, 3 Cumberland pl. Portman sq.
1855. Salt, Captain Thomas, 2nd Stafford Militia, Stafford
1852.*Salt, Titus, Bradford, Yorkshire
1852. Sampson, Samuel, Sellers hall, Church end, Finchley
1850. Samuel, James, 26 Gt. George street, Westminster
1852. Sanctuary, Thomas, Horsham, Sussex
1855. Sanderson, Charles, Egerton-house, Glossop road, Sheffield
1854. Sandford, Francis R., Privy Council Office, Whitehall
1856. Sandon, Lord Viscount, 39 Grosvenor square
1854. Sartoris, Charles, 88 St. James's street
1842. Saunders, William Wilson, F.R.S., East Hill, Wandsworth
1855. Savory, Thomas Ames, 143 New Bond street
1848. Saward, Michael, 9 Chatham place, Blackfriars
1856. Saxby, John, 6 St. Martin's street, Leicester sq.
1854.*Saye and Sele, the Rev. Lord, Broughton Castle, near Banbury, Oxon
1854. Sayer, Edward, 9 Clifford street, Bond street
1853. Scalia, L., 4 Wyndham place
1853. Scamell, George, Melrose lodge, Holloway
1856. Schaeffer, Chevallier Ignatius de, Imperial Royal Austrian Consulate General, 29 St. Swithin's lane, City
1845. Schneider, Richard, 3 Circus road, St. John's wd.
1842.*Scholey, William, Lauriston, Larkhall lane, Clapham
1850.*Scholefield, W. Freer, Fairlawn, Ripon
1856. Schuster, Leo, Roehampton
1854. Sclater, George, Hoddington house, Odiham
1852. Scoones, Major Edward, Tunbridge
1854. Scott, Abraham Charles, 24 Ely place, Holborn
1852. Scott, George Walter, 7 Lothbury
1816. Scott, Henry Dundas, 10 Eccleston street, Pimlico
1856. Scott, James, 65 Cadogan-place, Belgrave square
1853. Scott, James, 1 Eccleston street, Pimlico
1847. Scott, J. Anthony, 13 Pall Mall East
1854. Scott, John B., M.A., Bungay, Suffolk
1852. Scott, Michael, 26 Great George st. Westminster
1854. Scott, Thomas, 5 Charing cross
1856. Scratchley, Arthur, 3 Parliament street
1851. Sedgwick, John Bell, 1 St. Andrew's place, Regent's park
1851. Sells, Edward Perronet, 55 Bankside
1825.*Sex, Edward, Stock Exchange
1853. Seymour, Henry Danby, M.P., Knoyle house, Hindon, Wilts, and 39 Upper Grosvenor street
1856. Sharer, Thomas, 11 St. Benet's place, Gracechurch street
1847. Sharp, Edmund, 2 Devonshire terrace, High st., Marylebone
1856. Shaw, Bentley, Woodfield house, Lockwood, near Huddersfield
1856. Shaw, William Edward, R.N., Rosslyn hill, Hampstead
1856. Shearer, Bettesworth Pitt, Swanmore house, Bishop's Waltham, Hants
1806. Shears, David T., Bankside
1852. Shepard, John, Halifax
1843. Sheppard, Richard, Newport Pagnell
1847. Sheriff, G. W., 61 Friday street
1853. Sheriff, John William, Ridgway hill, Wimbledon
1851. Shillito, George, Manor park, Streatham, Surrey
1853. Shoolbred, James, jun., Oldfield terrace, Acton Vale
1811.*Shore, Offley, Church Dale, Ashford, Derbyshire
1808.*Shuter, T. Allen, Hooley house, Colesdon, Surrey
1812. Sich, Henry, Chiswick
1849. Siemens, Charles William, 7 John st., Adelphi
1854. Sier, Rev. Ths., D.C.L., Ravensden, Bedfordshire
1852. Sillifant, John, Coombe, near Copplestone, North Devon
1848. Silverlock, H., 3 Wardrobe ter., Doctor's Coms.
1851. Sim, John C., 9 Clifton place, Hyde pk. gardens
1853.*Simmonds, Lieut-Col. John Linton Arabin, R.E., C.B., Board of Trade
1855. Simmonds, Peter Lund, 8 Winchester st., Warwick square, Pimlico
1856. Simons, George, Beddington, Surrey, and 10 Little Britain
1843. Simpson, James, 29 Great George street, Westminster
1853. Simpson, William, 2 Eccleston street, Chester sq.
1843. Simpson, William Butler, 456 Strand
1848. Skeat, Wm., 6 Park place villas, Maida hill West
1853. Skey, Frederick Carpenter, M.D., F.R.S., 9 Hertford street, May fair
1853. Slaney, R. A., Shrewsbury, and 5 Bolton row, May fair
1854. Slee, Charles W., 53 Doughty st., and 6 Newgate st.
1856. Slight, Frederick, London, Brighton, and South Coast Railway, London bridge
1855. Sloper, Joseph, 215 Oxford street
1816.*Smart, Sir George, 91 Great Portland st.
1842. Smee, Alfred, F.R.S., 7 Finsbury circus
1851. Smee, William Alfred, Finsbury pavement
1847. Smirke, Sidney, A.R.A., 79 Grosvenor street
1851. Smith, Charles, Church house, 14 Churchyard row, Newington butts
1814.*Smith, Charles H., 29 Clipstone street
1852.*Smith, Rev. Charles Lesingham, Little Canfield Rectory, Dunmow, Essex
1851. Smith, Edward Osborne, 24A Bryanstone square
1843. Smith, George, 4 Frederick place, Old Jewry
1849. Smith, George, 21 Russell square
1852. Smith, Henry Lilley, Southam
1855. Smith, James, Seaforth, Liverpool
1815.*Smith, James Scott, Distillery, Whitechapel
1852. Smith, John, Malton
1854. Smith, John, 8 Upper Fountain place, City road
1852. Smith, Rev. J. H., Leamington
1847. Smith, John Jobson, Roscoe place, Sheffield
1850. Smith, Richard, Priory, Dudley
1856. Smith, Samuel, 5 Fell st., Wood st., Cheapside
1855. Smith, Thomas Macdougall, Chapel place, Duke street, Westminster
1852. Smith, William, 37 Tavistock square
1847. Smith, William, 10 Salisbury street, Strand
1850. Smith, William Henry, 186 Strand
1853. Smith, William Henry, 8 Upper Fountain place, City road

1852. Smith, William Wyke, Barnet
1856. Smith, William, Little Woolston, Buckinghamshire
1852.*Smithies, Joseph J., Arrogan rd., Twickenham
1851. Soames, James, May's buildings, St. Martin's lane
1835.*Solly, James, Tipton, near Birmingham
1853.*Solly, Richard, Sheffield
1804.*Solly. Richard Horsman, F.R.S., 48 Great Ormond street
1828.*Solly, Samuel Reynolds, F.R.S., 10 Manchester square, and Serge hill, Bedmond, Hemel Hempstead
1838.*Solly, Prof. Edward, F.R.S., 15 Tavistock sq.
1837.*Solly, William Hammond, Bloxworth Rectory, Blandford, Dorsetshire
1845. Sopwith, Thomas, F.R.S., Allenheads, Haydonbridge
1853. Soward, John, 62 Gower street
1855. Spark, Henry King, Darlington
1852. Sparks, William, Crewkerne
1851. Spicer, Henry, 22 Crescent, Highbury
1854. Spicer, William Revel, 19 New Bridge street, Blackfriars
1848. Spiers, Richard James, Oxford
1854. Spon, Francis Nichols, 16 Bucklersbury, City
1853. Spottiswoode, George, New street square
1856. Spottiswoode, William, F.R.S., East Harding st. Gough square
1852. Spurrell, Flaxman, Bexley heath
1852. Squire, William, 54 Camden sq., Camden town
1853. Stafford, Marquis of, M.P., 2 Hamilton pl., Piccadilly
1856. Stainton, Henry Tibbats, Mountsfield, Lewisham
1855. Staley, Rev. Thomas Nettleship, M.A., Wandsworth
1853. Staniland, William, Selby, Yorkshire
1853.*Stanley, Lord, M.P., Knowsley, Lancashire, and 23 St. James's square
1853. Stansbury, Charles Frederick, A.M., 67 Gracechurch street
1852. Stansfeld, James, Halifax
1856. Staples, John, Albion tavern, 153 Aldersgate street
1802.*Stapylton, M., Myton hall, Boroughbridge
1851. Startin, James, 3 Savile row
1838. Staunton, William Sandys, 9 Strand
1856. Stebbing, Rev. Henry, D.D., F.R.S., Hampstead road
1855. Steibel, Isaac M., 81 Gower street, Bedford sq.
1856. Stenhouse, John, LL.D., F.R.S., St. Bartholemew's Hospital
1854. Stephens, Francis, 36 Great Winchester st.
1852. Stephens, Henry, 54 Stamford street
1851. Stephens, J. P. D., Ivy Bank, Notting hill
1852. Stephens, William, Ives place, Maidenhead
1851. Stephenson, Henry Palfrey, 58 Pall Mall
1842. Stephenson, Robert, M.P., F.R.S., 24 Great George street, Westminster
1851. Stirling, Thomas, Belvidere wharf, Belvidere road, Lambeth
1852. Stirton, George James, 13 Beaufort builds., Strand
1852. Stohwasser, Joseph, 39 Conduit street, Regent st.
1851.*Stones, William, 10 Queenhithe, City
1852. Storey, Thomas, Lancaster
1816. Storey, William John Clayton, 12 Marlborough place, St. John's wood
1855.*Streatfield, J. Fremlyn, 1 Finsbury square
1854. Street, William Fauntleroy, Lower Clapton Middlesex
1852. Strong, Rev. William, Thorpe hall, Peterborough
1856. Sturge, Edmund, Birmingham
1852. Stubbs, Thomas Edward, 15 Northampton park, Islington
1833. Sutherland, the Duke of, K.G., Stafford house, St. James's
1800.*Sutton, Robert, 5 Magdalene row, Great Prescott street
1851. Sutton, Henry, 30 Sackville st., Piccadilly
1855. Suter, Richard, 28 Fenchurch street
1855. Swarbrick, Samuel, Derby
1852. Swinburne, William Alfred, 93 Upper Thames st.
1854. Sykes, John, Privy Council Office, Whitehall
1855. Sykes, Col. W. H., F.R.S., 47 Albion st., Hyde pk.
1848. Symonds, Arthur, 9 New street, Spring gardens
1854. Symonds, John, Ingram court, Fenchurch st.
1855. Symons, Alexander, 19 Montague pl., Russell sq.
1854. Symons, Jelinger C., Privy Council Office, Whitehall

1848. Taber, John, Herne hill, Dulwich
1852.*Tait, Robert Scott, 5 Queen Anne street
1855.*Tamplin, Richard William, 33 Old Burlington st.
1845. Tanqueray, Charles, Vine street, Bloomsbury
1853. Tapp, Thomas Berrett, Hertford
1852. Tartt, William Macdowel, Sandford pl., Cheltenham
1850.*Tassie, Wm., 8 Upper Philimore pl., Kensington
1852. Taylor, George, Horton lane, Bradford
1856. Taylor, James, 109 Fenchurch street
1855. Tayler, John George, Uxbridge
1851.*Taylor, John, Burnfoot house, Wigton, Cumberland
1846. Taylor, John, jun., 6 Queen's place, Southwark bridge
1839. Taylor, John, jun., 22 Parliament street
1850. Taylor, William, Newport Pagnell
1855. Temple, Robert, 25 Bernard street, Russell square
1855. Temple, Rev. Frederick, Notting hill
1846.*Tennant, James, 149 Strand
1845. Terni, Vito, 3 Crown court, City
1852. Teulon, Samuel Saunders, Lansdowne place, Brunswick square
1855.*Thomas Christopher James, Clifton, Bristol
1853. Thomas, Francis B., 153 New Bond street
1856. Thomas, John Evan, F.S.A., 7 Lower Belgrave pl
1853. Thomas, John William, 153 New Bond street
1847. Thompson, John, 1 Campden hill terrace, Kensington
1849. Thomson, Adam, 25 New Bond street
1856. Thomson, Adam, 19 Upper Southwick street, Hyde park
1849. Thornton, George, 25 Queen's road, Glo'ster gate, Regent's park
1851.*Thurston, Charles Bosworth, 9 Southampton st., Bloomsbury
1850. Till, Richard, Guildhall buildings, City
1844.*Tite, William, M.P., F.R.S., 42 Lowndes square
1856. Tolhausen, Alexander, 6A Lodge road, St. John's wood
1850. Tomkins, Edward, 19 Fleet street
1850. Tomlinson, Rev. J. P., Sherfield Rectory, Romsey, Hants
1802.*Tooke, William, F.R.S., 12 Russell square
1835.*Tooke, Arthur William, jun., 39 Bedford row, and Pinner hill, near Watford, Herts
1838. Topham, Charles, Eagle Wharf road, New North road
1853. Towers, George Augustus, Hertford
1853. Towneley, Charles, M.P., F.R.S., Towneley park, Burnley, and 12 Charles street, Berkeley sq
1855. Tracy, John Ibbetson, 328 Strand
1853.*Travers, John Ingram, 19 St. Swithin's lane
1852. Trent, Edwin Ward, Brooksby walk, Homerton
1852. Trevelyan, Arthur, Tyneholme, Pencaithland, N.B.
1852. Trevelyan, Sir Walter Calverley, Wallington, Newcastle-on-Tyne
1855. Trevithick, Frederick Henry, Leytonstone, Essex
1854. Tripp, James S., Lombard street chambers, Clement's lane, City
1856.*Truman, Charles, West hill, Highgate, Kentish town
1849. Tuck, J. H., 34 Great George street
1851. Tucker, Henry, Stamford hill
1852. Tudor, Edward Owen, 46 Westbourne terrace
1852. Tudor, Edward Scripps, 167 Upper Thames street
1853. Tufnell, Edward Carleton, 26 Lowndes square

1842. Tulloch, James, F.R.S., 16 Montague place, Russell square
1851. Turnley, Joseph, 15 Russell square
1855. Turner, Edwin, New Ashfield, Bradford, Yorkshire
1855. Turton, Thomas Burdett, West lodge, Sheffield
1856. Tuson, Richard V., St. Bartholomew's Hospital
1856. Tussaud, Francis Babington, 58 Baker st., Portman square
1852. Tuxford, George Parker, 246 Strand, and Elm Bank house, Barnes, Surrey
1856. Twemlow, Col. George, Clapham common
1848. Twining, Henry, Grove house, Clapham common
1817. Twining, Rd., F.R.S., 13 Bedford pl., Russell sq
1853.*Twining, Samuel Harvey, 215 Strand
1847.*Twining, Thomas, jun., Perryn house, Twickenham
1851. Tyler, George, 24 Holloway place, Holloway
1856. Tylor, Alfred, F.G.S., Warwick lane
1852. Tyssen, J. R. D., Manor house, Hackney

1820.*Uwins, Thomas, R. A., Staines, Middlesex
1853. Uzielli, Matthew, Hanover lodge, Regent's park

1852. Vane, Rev. John, 29 Cambridge street, Hyde park
1814.*Varley, Cornelius, 7 York place, Kentish town
1851. Varley, Cornelius John, 7 York pl., Kentish town
1842. Varty, Thomas, 31 Strand
1853. Vaughan, Charles John, D.D., Harrow
1853. Vaughan, Rev. David James, M.A., St. Mark's Parsonage, Tenter ground, Whitechapel
1848.*Vaughan, George, 88 Westbourne ter., Hyde park
1856. Vaughan, , Middlesborough, Yorkshire
1855. Vavasseur, James, 9 Trump street, Cheapside
1848. Veitch, James, M.D., 6 Ovington square, Brompton
1855. Vernon, Henry, 168 New Bond street
1850. Vignoles, Charles, F.R.S., Duke st., Westminster
1849. Vivian, B. T., Breage, Helston, Cornwall

1853. Wade, I. M., 45 Lincoln's inn fields
1854. Waddilove, Alfred, D.C.L., the College, Doctors' commons
1848. Waite, Henry, Rose hill, Dorking
1852. Wales, the Rev. Chancellor, Northampton
1853. Walenn, William Henry, 68 Chancery lane
1854. Waley, Jacob, M.A., 20 Wimpole street
1849. Waley, Simon W., 22 Devonshire place
1821. Walker, James, F.R.S., 23 Great George street, Westminster
1854. Walker, Major James Scott, Junior United Service Club
1852. Wallace, Joseph, Portaferry
1853. Wallis, Thomas Henry, 64 Long Acre
1853. Walmsley, Sir Joshua, M.P., 101 Westbourne ter.
1852. Walters, Rev. Charles, M.A., Wyke Rectory house, Winchester
1851. Wampen, Henry, 91 Upper Ebury street, Pimlico
1855. Wanostrocht, Vincent, 10 Swithin's lane, Lombard street
1853. Ward, Lord, Dudley house, Park lane
1853. Ward, Capt. E. Wolstenholme, R.E., Sydney, New South Wales
1810.*Ward, William, A 3 Albany, Piccadilly
1852. Warner, Charles Borham, 8 Crescent, Jewin street
1849. Warren, Alfred, The Grove, Kentish town
1856. Warren, Henry George, 35 Gloucester street, Queen square, Bloomsbury
1853. Warren, Joseph, Loxdale, Market Drayton
1847. Warriner, Henry, 6 The Terrace, Kennington
1849. Wass, Charles Wentworth, 3 New Burlington street
1849. Waterhouse, A., 1 St. Paul's churchyard
1852. Waterhouse, Samuel, Halifax
1851. Watherston, J. H., 16 Henrietta street, Covent garden
1855. Watkin, Edward, Timperley, near Manchester
1855. Watkins, Zachariah, 22 City road, Finsbury square
1856. Watson, Charles, King Cross street, Halifax, Yorkshire
1852. Watson, J. J. W., Ph. D., 44 Upper Brook street, Grosvenor square
1820.*Watson, J. Webster, Latymer lodge, Hammersmith
1854. Watson, Thomas, M.D., Henrietta street, Cavendish square
1853. Way, Major, R.A., 9 Holles street, Cavendish sq.
1855. Weallens, William, Newcastle-on-Tyne
1853. Webb, Henry Bellamy (Messrs. Baring, Brothers and Co.) India buildings, Liverpool
1847. Webb, John, 11 Grafton street
1851. Webster, R., 74 Cornhill
1838. Webster, Thomas, F.R.S., 2 Great George street, Westminster
1853. Weddell, George, 11 Grove terrace, Kentish town
1838. Weedon, Thomas, 41 Hart street, Bloomsbury
1851. Weir, Edward, 16 Bath place, New road
1849. Wellington, the Duke of, Apsley house, Piccadilly
1825. Wells, Jonah Smith, Carpedens, near Watford, Herts
1853. Wells, William, M.P., 22 Bruton street
1849. Westall, Richard, 115 Lower Thames street
1853. Westall, William Mawley, 5 Love lane, Aldermanbury
1853. Westbrook, Andrew, Freeman's court, Cheapside
1851. Westhead, Joshua Proctor Brown, Lea castle, near Kidderminster
1841. Westley, William, 24 Regent street
1853. Westminster, the Marquis of, P.C., 33 Upper Grosvenor street
1856. Wetter, Conrad, 67 Myddelton square, Clerkenwell
1847. Whatman, James, M.P., F.R.S., Vinters, Maidstone
1855. Wheatcroft, Joseph, Wirksworth
1856. Wheately, E. B., Cote hall, Yorkshire
1856. Wheen, Richard, Blackheath
1855. White, Edward, 12 Great Marlborough street
1853. White, John, Cowes, Isle of Wight
1853. White, John Francis, 50 Hunter-street, Brunswick square
1856.*Whitehead, James Heywood, Royal George Mill, Manchester
1843. Whishaw, Henry, 3 Gray's inn square
1843. White, George Frederick, Millbank street
1852. Whitfeld, Henry, Ashford, Kent
1852. Whiting, John, M.D., Nereson house, Ramsgate
1852. Whitmore, George, 17 Sussex gardens
1854. Whitwell, John, Kendal, Westmoreland
1844. Whitworth, Joseph, 1 Chorlton street, Manchester
1847. Whittingham, Charles, Took's court, Chancery lane
1855. Whittington, Rev. Richard, Chapter house, St. Paul's
1854. Wickham, Henry Wickham, M.P., Kirklees hall, Mirfield, Yorkshire, and 3 Chapel street, Grosvenor square
1855. Wicks, John, 59 Onslow square, Brompton
1821.*Wigg, Francis, 7 Bedford row
1831.*Wigg, George, 61 Westbourne terrace, Hyde park
1855. Wilcocks, John, 18 Crescent, Camden road villas
1850. Wild, Charles Kemp, 113 Cheapside
1821.*Wildman, Col. Thomas, Newstead abbey, Notts
1848. Wilkins, William Crane, 24 Long Acre
1856. Wilkinson, George, Ivy lodge, Witham, Essex
1850. Wilkinson, Henry, 27 Pall Mall
1853. Wilkinson, Joseph, 31 St. George's road, Borough
1852. Wilkinson, Josiah, Southampton lodge, Highgate
1854. Wilkinson, Samuel, Stockport
1847. Wilkinson, William Arthur, M.P., Beckenham, Kent
1855. Williams, Charles, C.B., 8 Bishop's road, Victoria park
1853. Williams, Charles Croft, Roath Court, near Cardiff
1854. Williams, Charles Wye, Dublin Steam Packet Company, Liverpool
1854. Williams, I. F., High street, Shrewsbury
1852. Williams, James, 18 Westgate buildings, Bath
1852. Williams, R., 62 Strand

1855. Williamson, Dr. Alexander W., University College, Gower street
1836. Willich, Charles M., 24 Suffolk st., Pall Mall east
1847. Wilson, Edward, 1 Albion place, Blackfriars
1856. Wilson, Edward Thomas, Collegiate School, Brixton hill
1854. Wilson, Frederick J., 32 Cadogan place, Chelsea
1845. Wilson, George Fergusson, F.R.S., Wandsworth
1854. Wilson, Isaac, Middlesborough
1851. Wilson, John, F.R.S.E., Heath lodge, Iver, Bucks, and Preston street, Edinburgh
1856. Wilson, John, Upper Tooting, Surrey
1818.*Wilson, Lestock Peach, 11 King's Arms yard, Moorgate street
1853. Wilson, Alderman Richard, Victoria house, Bramley, near Leeds
1842. Wilson, Robert, Copthall buildings, Bank
1855. Wilson, Samuel King, 38 Duke st., Manchester sq.
1854. Wilson, Alderman Samuel, Beckenham, Kent
1810.*Wilson, Thomas, Gawler place, Adelaide, South Australia
1852. Wilton, the Earl of, 7 Grosvenor square
1854. Winchester, the Bishop of, 19 St. James's square
1853. Winchester, William Henry, F.R.C.S., 14 Westbourne terrace road
1853. Window, Frederick Richard, 8 Craig's court, Charing cross
1852. Wing, William, 163 New Bond street
1822. Winkworth, Thomas, 7 Sussex place, Canonbury
1823.*Winsor, Frederick Albert, 57 Lincoln's inn fields
1853. Winstone, Benjamin, 7 Ely place, Holborn
1856. Winter, James, jun., 101 Wardour street
1849. Wire, David Williams, 9 St. Swithin's lane, City
1849. Wodderspoon, James, 17 Portugal st., Lincoln's inn
1848. Wolff, Zave, 23 Church street, Spitalfields
1856. Wolrige, John Camplin, Plymouth Iron Works, Merthyr Tydvil
1844. Womersley, C. J., Hastings
1855. Wood, Benjamin, 3 Priory ter., Tonbridge
1848.*Wood, C. H. L., Hillfield, Hampstead
1856. Wood, Frederick, M.R.C.S., St. Bartholomew's hospital
1854. Wood, John, 23 Oxford square
1854. Wood, John, 8 Falcon street, Aldersgate st.
1852. Wood, Rev. Sir John Page, Bart., Riverhall place, near Witham
1854. Wood, William, Monkhill, Pontefract
1856. Woodhouse, John Thomas, Overseal, near Ashby-de-la-Zouch
1845. Woodcroft, Bennet, Master's Office, Southampton buildings
1854. Woodd, Basil Thomas, M.P., 14 Great Cumberland street, Hyde park
1850.*Woodd, Robert Ballard, 4 Devonshire place, Hampstead
1854. Woodrooffe, Rev. Thomas, Winchester
1853. Woods, Edward, 8 New Palace yard, Westminster
1855. Woods, Henry, Wigan
1854. Woollcoombe, Thomas, Devonport
1854. Woolley, Rev. Joseph, L.L.D,, Portsmouth
1853. Woolmer, Shirley Foster, 3 Garden court, Middle Temple
1854. Wovendon, Joseph, 71 Market street, Manchester
1851.*Wray, George Woodstock, Verulam buildings, Gray's inn
1854. Wrey, John William, Littledown, Wells, Somerset
1856. Wright, Charles Edmund, 57 Red Cross st.
1849. Wright, John, Upnor, near Rochester
1855. Wright, William, Wirksworth
1852. Wrightson, Wm. Battie, M.P., 22 Upper Brook st
1852. Wyatt, Matthew Digby, 54 Guildford street, Russell square
1855. Wyld, George, M.D., 6 Great Cumberland street, Hyde park
1853. Wylde, R. G., 63 Onslow square, Brompton
1851. Wyndham, Edward, 14 Blandford square
1852. Wyon, Leonard C., 54 Hamilton terrace, St. John's wood

1851. Xenos, Stefanos, 19 London street, Fenchurch st.

1849. Yarborough, the Earl of, 16 Arlington street, Piccadiily
1856. Yarnold, John, Camden hall, Camden town
1849. Yarrow, Thomas A., Gresham house, Old Broad st
1851.*Yeates, Andrew, 12 Brighton place, New Kent road
1853. Yeats, John, F.R.G.S., the Middle School, Peckham
1843. Yewd, William, Eldon chambers, 20 Devereux court, Strand
1844. Yool, Henry, 17 Harewood square
1855. Young, Charles D., North Bridge, Edinburgh
1855. Young, Francis Mortimer, Leeds
1853. Young, George, Leeds
1855. Young, John, 8 East Parade, Leeds
1855. Younghusband, Capt C. W., Royal Artillery Institution, Woolwich

1853. Zetland, the Earl of, Upleatham, Redcar, Yorkshire

LIST OF CORRESPONDING MEMBERS.

Arpino, Guiseppe, Naples
1855. Audley, Charles, 40 Rue de Madame, Paris

1852. Bâche, Alexander Dallas, LL.D., Washington
1852. Bianchini, Gaetano, Florence
1851. Bolley, Dr. Pompeius, Aaran
1854. Bowring, His Excellency Sir John, Hong Kong
1851. Brand, C., Wurtemburg
1851. Brouckère, Charles de, Brussels
1851. Buschek, Charles, Austria

1852. Chisholm, Captain, South Australia
1852. Chisholm, Mrs., South Australia
1851. Corridi, Filippo, Florence
1854. Crawcour, Dr., New Orleans Academy of Science, New Orleans, Louisiana, U.S.
1851. Cuylits, Charles, Belgium

1851. Dodge, N. S., United States

1851. Ecchevaria, Ramonde, Spain
1851. Eicholzer, —, Switzerland
1851. Elmkadden, Hamda, Tunis

1851. Falconer, Hugh, M.D., F.R.S., Calcutta
1852. Fisher, G. F., Salem, New Jersey, U.S.
1855. Franscini, F. C., Berne, Switzerland
Fresenius, Professor, Wiesbaden

1852. Gail, Borden, jun., Texas
1851. Goossens, G., Delft

Hamel, Dr., St. Petersburg
1851. Hebeler, M., Prussia
1852. Henry Joseph, LL.D., Washington
1852. Huffnagle, Dr., Calcutta
1856. Hulot, Anatole, Hotel des Monnaies, Paris
1852. Hume, Dr., Calcutta
1852. Hunter, Dr., Madras

1851. Jobard, J. B., A.M., Brussels

1851. Kamensky, Gabriel, Russia
1856. Kasteele, M. Van de, the Hague
1852. Key, Professor T., Madras

1844. Lassus, M., 65 Rue St. Germain, Paris
1854. Le Play, F., 17 Rue St. Dominique, Paris
1851. Lencissa, Chevalier, Sardinia
1852. Lister, Dr., Madeira
Lutke, Admiral, St. Petersburg

1855. Maelen, Phil Vander, Brussels
1852. McClelland, Dr. Calcutta
1852. Milligan, J., Van Dieman's Land

1852. O'Shaughnessy, Dr., F.R.S., Calcutta

1852. Peterson, George, St. Petersburg
1852. Piglheim, M., Hamburgh

1851. Ralli, M. Lucas, Athens
1852. Rose, Professor H., Berlin
1851. Rössler, M., Nixdorf, Bohemia

1851. St. John, John R., United States
1851. Sagra, Ramon de la, Spain
1851. Sallandrouze de Lamornaix, Paris
1852. Scharling, Professor, Copenhagen
1851. Schaffheutl, Dr., Munich
1851. Schwartz, Dr. W., Austria
1851. Seyffarth, W., LL.D., Saxony
1851. Silliman, Benjamin, Yale College, Connecticut, U.S.
1851. Stein, Baurath, Mentz

1825. Thompson, Dr., Mexico
1852. Tilghman, Richard Albert, Philadelphia
1851. Tottie, Charles, Norway

1850. Urling, R. W., 19 Rue de Brabant, Brussels

1851. Valdez, Antonio, Portugal
1851. Vanzeller, F. J., Portugal

1856. Ward, John, Hastings street, Calcutta
1852. Wayland, Francis, D.D., Providence, Rhode Island
1851. Westenholz, Regnar, Denmark
1852. Wight, Dr., Calcutta

1851. Zohrab, Edward, Turkey

MEMORANDUM AS TO UNION OF INSTITUTIONS WITH THE SOCIETY OF ARTS, LONDON.

THIS Union was established on the 18th of May, 1852, at a Conference held in the Society's House in the Adelphi—the Marquis of Lansdowne in the Chair—between the Representatives of 146 Institutions, certain Representatives of the Society of Arts, and other gentlemen especially interested in the movement.

The principle objects of the Union are:—

1. That the experience and information of each separate Institution be rendered available to the whole body.

2. That there be an Interchange of Privileges between the Members of different Institutions, so that the Members of any one Institution being temporarily in the neighbourhood of any other may enjoy at that other, for a limited period, the privileges of admission to its Lectures, Library, Reading-room, and Exhibitions.

3. That facilities be afforded for effecting engagements with competent Lecturers.

4. That Books, Maps, Philosophical Instruments, &c., be procured at reduced rates.

5. That facilities be afforded, by interchange and otherwise, for the formation of Local Museums, Exhibitions, &c.

6. That endeavours be made through the united action of the associated Institutions, to procure an amendment of the Laws which affect these bodies; that the Parliamentary Papers be distributed among them; and that their *status* should be generally improved.

7. That the Institutions be assisted to become also places of systematic instruction, with systematic examinations and certificates of the results of studies.

The objects of the Council of the Society of Arts are,—neither to govern the Institutions, nor to supersede their own efforts for improvement; but to stimulate, assist, and supplement their efforts and to endeavour to enhance their success.

The Annual Conferences, the weekly *Journal of the Society of Arts*, which is supplied gratuitously to each Institution in Union, and constant Correspondence with the Institutes, have a powerful tendency towards the attainment of the first of the objects stated above.

The second is, to a great extent, provided for; nearly 200 Institutions having agreed to the Interchange of Privileges. The Society of Arts also grants certain privileges in regard to its own Meetings and Exhibitions to Institutions in Union. Institutions within twelve miles of the General Post-office have three transferable admissions to each Meeting and Exhibitions of the Society of Arts. Members of Institutions beyond this limit, on presenting during office hours (ten to four) a note, signed by their Secretary, may obtain similar privileges.

The third object will be more completely accomplished when neighbouring Institutions shall have been more accustomed to co-operate for mutual benefit. The Society publishes a General List of Lecturers, both Paid and Unpaid. This list gives the names and addresses of the Lecturers, and the subjects on which they lecture. It also contains information as to Apparatus and Diagrams suitable for the use of Lecturers, where they may be obtained, and at what cost. A copy of this list is furnished free to each Institution in Union.

The fourth object has been already attained to a considerable extent; the Council having made arrangements with a publishing firm for supplying the associated Institutions with Books at a reduction of 27½ per cent., and with Periodicals at a reduction of 25 per cent. on the published prices. The committee of Privy Council of Education, on the representation of the Council of the Society of Arts, have agreed to extend to Institutions in Union with the Society the privilege of purchasing books on the same very favourable terms as are now enjoyed by the schools under the inspection of the Committee of Council.

With respect to the fifth object, several of the Institutions have agreed to interchange Specimens of Natural History, Manufactures, &c., for Museums. As regards Exhibitions, the Society of Arts has in circulation, on loan, a large number of specimens of Photography, of Nature Printing, of Chromo-Lithography, &c.

With reference to the sixth object, the Council direct attention to the act passed in 1854, intituled the "Literary and Scientific Institutions Act." The question of Exemption from local Taxation was under the consideration of Parliament during the last session, and it is intended to renew the subject when Parliament again meets. It may here be stated that the Commissioners of Patents have allowed many Mechanics' Institutions in different parts of the country, where no Free Libraries exist, to become the depositaries of their valuable publications, the Specifications and Indexes of Patents, on the Institutions undertaking to allow them to be consulted at all reasonable hours daily by the public, free of all charge whatsoever. The donations are made to the local authorities for the use of the town, and they are permitted to place the publications in the Institutions for reference.

The Council of the Society of Arts are now engaged in the development of a scheme of general Examinations applicable to the Classes at the Institutions in Union with the Society. The first Annual Examination was held in June, 1856. The second Examination will be held in June, 1857.

There are now 340 Institutions in Union with the Society of Arts.

Any Institution desirous of entering into Union with the Society of Arts, must fill up, sign, and return to the Secretary, a printed Form of Declaration, accompanied with a copy of its Rules. When this form has been approved by the Council, the Institution will at once be considered as "in union." The required subscription of two guineas, for carrying on the general correspondence of the Union, may be paid in either of the two following ways: the President, or other analogous officer of the Institution, may be elected a member of the Society of Arts; or, the Institution may contribute from its own funds the payment of two guineas. In the former case the gentleman so selected will enjoy all the privileges of a Member, and will, at the same time, give to his own Institution, so long as he continues to hold the same office in it, the advantages of the Union. In the latter case, the Institution itself will receive the advantages of the Union, but no individual member of the Institution will enjoy the full privileges of a Member of the Society of Arts.

The managers of Village Libraries, Village Reading Rooms, Village Lectures, &c., in connection with any Local Union, such as the Yorkshire Union, the Hants and Wilts Adult Education Society, &c., not being fully constituted Institutions, may obtain the existing advantages of Union with this Society in consideration of the payment of £2 2s. from the annual funds of the Local Union, but it must be understood that the Society relies on the officers of the Local Union for a careful discrimination of those bodies which ought, from those which ought not, to be expected to subscribe separately for the advantages of the Union with the Society of Arts, and the Council reserve to themselves the power of re-considering the arrangements, if it should be found that bodies not contemplated herein are enabled to avail themselves of what is proposed.

Pupils who may be pursuing systematic studies in Evening Schools, or otherwise under the auspices of the Local Union where there are no Institutes, may be admitted to the examinations on the same footing as the Students of the Classes of the Institutes in Union with this Society.

Trade Schools, and such other Schools as profess to teach the elements of Manufacturing or Commercial Knowledge, are eligible for admission into Union on the same terms as Mechanics' Institutions.*

(By order)
P. LE NEVE FOSTER,
Secretary.

Society's House, Adelphi,
1*st Nov.*, 1856.

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* Purely classical schools are not admissible.

LIST OF INSTITUTIONS IN UNION.

N.B.—In the following List, the Institutions which have agreed to a General Interchange of Privileges are denoted by an asterisk. By means of this organisation and arrangement, a Member of one Institution, when visiting a town in which any other is situated, will be enabled to enjoy at that other, for the time being, all the advantages of membership. Any person wishing to avail himself of this privilege, needs only to present his Card of Membership, it being understood that he will abide by the Bye-Laws of the particular Institution he may visit, as well in regard to the time to which this privilege may be extended as to all other matters.

*ABERDEEN, Mechanics' Institution
*Accrington, Mechanics' Institution
*Allenheads (near Haydon Bridge), Library and News room
Alton, Mechanics' Institution
Andover, Library and Institute
Annan, Mechanics' Institute
*Ashford, Mechanics' Institute
Ashton and Dukinfield, Mechanics' Institution

*Bacup, Mechanics' Institution
Bakewell and High Peak, Institute
*Banbury, Mechanics' Institute
*Barnet, Institute
*Barnsley, Mechanics' Institute and Literary Society
*Barnstaple, Literary and Scientific Institution
*Barrhead (near Glasgow), Mechanics' Institution
*Basingstoke, Mechanics' Institute
*Bath, Athenæum
* ,, Commercial and Literary Institution
*Battersea, Literary and Scientific Institution
,, Branch of Belmont Mutual Improvement Society
Battle, Mechanics' Institution
*Beccles, Public Library and Scientific Institution
*Bedford, Literary and Scientific Institution
Belfast, Working Classes Association
Berkhampstead, Mechanics' Institution
*Bexley Heath, Society for the Promotion of Useful Knowledge
*Bilston, Institute
Birmingham, Polytechnic Institution
,, Messrs. Chance's Glass Works Library and Reading Room
*Bishop Stortford, Literary Institution
Blackburn, Literary, Scientific and Mechanics' Institution
Blairgowrie and Rattray, Mechanics' Institution
Blandford, Institution
*Bodmin, Literary Institution
Bolton, Mechanics' Institution
,, Church Educational Institution
*Boston, Athenæum
Bradford (Wilts), Literary Institution
*Bradford (Yorkshire), Mechanics' Institute
*Braintree and Bocking, Literary and Mechanics' Institution
*Bramley, Mechanics' Institute
Brechin, Mechanics' Institution
Brentford, Literary and Scientific Institution
Bridport, Literary and Scientific Institution
Bridgend, Mechanics' Institute
*Bridgwater, Literary and Scientific Institution
*Brigg (Lincolnshire), Reading Society
Brighton, Athenæum and Young Men's Literary Union
,, London, Brighton, and South Coast Railway Literary and Scientific Institution
* ,, Mechanics' Institution
,, Royal Literary and Scientific Institution
*Bristol, Athenæum
,, Diocesan Trade School
*Bromley, Literary Institute
*Bromsgrove, Literary and Scientific Institution
Broseley (Salop), Reading Room and Library
Buckingham, Literary and Scientific Institution
Bucks and Berks Lecturers' Association (care of Rev. Edward Hale, Eton College)
*Buntingford, Literary Institute
*Burnley, Mechanics' Institution
*Burton-on-Trent, Literary Society
*Bury, Athenæum
Bury St. Edmund's, Athenæum and Suffolk Institute of Archæology and Natural History

Caistor, Mechanics' Institution
* Calne, Literary Institution
Cambo (near Newcastle-on-Tyne), Subscription Library
*Cambridge, Philo-Union Literary Society
*Cambridge and Cambridgeshire, Mechanics' Institute
*Cardiff, Athenæum
*Carlisle, Mechanics' Institute
,, Church of England Religious and General Literary Association
*Carmarthen, Literary and Scientific Institution
Chatham and Rochester, Strood, and Brompton, Mechanics' Institution
*Cheadle (Staffordshire), Mechanics' Institution and News-room
*Chelmsford, Literary and Mechanics' Institution
Cheltenham, Literary and Philosophical Institution
*Chepstow, Literary Institution
*Chester, Mechanics' Institution
Chesterfield and Brampton, Mechanics' Institute
*Chichester, Literary Society and Mechanics' Institution
Chippenham, Literary and Scientific Institution
*Cirencester, Literary, Scientific and Mechanics' Institution
,, Permanent Library
Clitheroe, Mechanics' Institute
Clonmel, Mechanics' Institute
Coalbrookdale, Literary and Scientific Institute
*Coalcleugh (near West Allendale), Library and News-room
Colchester, Mechanics' Institution
*Corfe Castle, Mutual Improvement Society
Cork, Royal Institution
Coventry, Institute
Crewkerne, Literary and Scientific Institution
*Crieff, Mechanics' Institution
*Croydon, Literary and Scientific Institution
*Cupar Angus, Society for Mutual Improvement

*Darlington, Mechanics' Institution
*Dawlish, Literary and General Knowledge Society
Dedham (near Colchester), Literary Institution
*Deptford, Institution
*Derby, Mechanics' Institution
,, Railway Literary Institution

*Devizes, Literary and Scientific Institution
*Devonport, Mechanics' Institute
*Dover, Museum and Philosophical Institution
Dublin, Statistical Society
*Dudley, Mechanics' Institution
*Dumfries and Maxweltown, Mechanics' Institution
*Dunmow (Essex), Literary and Scientific Institution
*Durham, Mechanics' Institute

East Retford, Literary and Sientific Institution
Ely, Mechanics' Institution
*Epsom and Ewell, Literary and Scientific Institution
*Exeter, Literary Society

Falkirk, School of Arts
*Falmouth, Mechanics' Institute
*Farnham, Mechanics' Institution
Feversham, Literary and Scientific Institution
*Folkstone, Harveian Institution

*Gainsborough, Literary, Scientific and Mechanics' Institution
*Gateshead, Mechanics' Institute
*Glasgow, Athenæum
* ,, Mechanics' Institution
Gloucester, Literary and Scientific Society
*Grantham, Public Literary Institution
*Greenwich, Society for the Acquisition and Diffusion of Useful Knowledge
Guernsey, Mechanics' Institution and Literary Society
*Guildford, Institute

Haley Hill (near Halifax), Working Men's College
*Halifax, Mechanics' Institution and Mutual Improvement Society
*Halstead, Mechanics', Literary and Scientific Institute
Hampton (Middlesex), Literary Society
Hartlepool (West), Literary and Mechanics' Institution
*Hastings, Mechanics' Institution
Hereford, Permanent Library
*Hereford, Philosophical, Antiquarian, and Literary Society
Hertford, Literary and Scientific Institution
* ,, Mutual Instruction Society
Hexham, Mechanics', Literary and Scientific Institution
High Green (near Sheffield), Mechanics' Institution
*Highgate, Literary and Scientific Institution
Highworth, Literary and Scientific Institution
Hitchin, Mechanics' Institution
*Holmfirth, Mechanics' Institution
*Horncastle, Mechanics' Institution
*Horsham, Literary and Scientific Institution
Huddersfield, Mechanics' Institution
,, Philosophical Society
*Huntingdon, Literary and Scientific Institution
Hythe, Reading Society

Ipswich, Mechanics' Institution

Kelvedon, Literary Institution
Kendal, Mechanics' Institution
King's Lynn, Stanley Library
Kingston-on-Thames, Mechanics', Literary and Scientific Institution

*Lancaster, Church of England Instruction Society
* ,, Mechanics' Institute
*Leamington, Royal Literary and Scientific Institution
Leeds, Mechanics' Institution and Literary Society
,, Philosophical and Literary Society
,, Yorkshire Union of Mechanics' Institutes
Leek, Mechanics' Institution
*Lees (near Manchester), Literary and Scientific Institution
*Leicester, Mechanics' Institution
*Leiston (near Saxmundham), Mechanics' Institute
*Leven, Vale of (Dumbartonshire), Mechanics' Institution
*Lewes, Mechanics' Institution
Limerick, Literary and Scientific Society
Lincoln and Lincolnshire, Mechanics' Institution
*Liskeard, Institution
*Liverpool, Bootle Educational Institution
,, Collegiate Institution
* ,, Mechanics' Institution
Llanelly, Mechanics' Institution
Lockwood, Mechanics' Institution
London, Bank of England Library and Literary Association
,, Beaumont Philosophical Institution
,, Belmont (Vauxhall), Mutual Improvement Society
,, Camberwell, Literary and Scientific Institution
* ,, Camden Town, Literary Institution
,, Crosby Hall Evening Classes for Young Men
,, Great Western Railway, Literary Society
* ,, Hackney, Literary and Scientific Institution
* ,, Jews and General Literary and Scientific Institution
* ,, Kingsland, Dalston, and De Beauvoir Town, Literary and Scientific Institution
,, London and South-Western Railway Literary and Scientific Institution
* ,, London Domestic Mission Society
* ,, London Mechanics' Institution
,, Marylebone Literary and Scientific Institution
,, Royal Polytechnic Institution
,, St. George's, Hanover-square, Lending Library and Reading Rooms
* ,, Pimlico, Literary, Scientific and Mechanics' Institute
,, Tailors' Labour Agency Literary Institute
,, Walworth, Literary and Scientific Institution
* ,, Westminster, Literary, Scientific, and Mechanics' Institution
,, Young Men's Societies Union in connection with the Presbyterian Church in England (care of Mr. John Hair), 20 Hanover-street, Islington
*Longton, Athenæum and Mechanics' Institution
*Loughborough, Literary and Philosophical Society
*Louth, Mechanics' Institution
*Ludlow, Literary Association and Mechanics' Institute
*Lymington, Literary Institution
*Lynn, Conversazione and Society of Arts

*Macclesfield, Society for the Acquirement of Useful Knowledge
*Maidenhead, Mechanics', Literary and Scientific Institution
*Maldon, Literary and Mechanics' Institute
Malton, Literary Institute
Manchester, Institutional Association of the Literary and Mechanics' Institutions of Lancashire and Cheshire
*Margate, Literary and Scientific Institution
*Market Drayton, Society for the Acquirement of Useful Knowledge
*Marlborough, Reading and Mutual Improvement Society.
Masham (Yorkshire), Mechanics' Institution and Literary Society
*Melbourne (Derbyshire), Mechanics' Institution
Middlesborough, Mechanics' Institute
*Modbury (near Ermebridge), Institution
Morpeth, Mechanical and Scientific Institution

*Nailsworth, Literary and Mechanics' Institute
Newark, Mechanics' Institution
*Newbury, Literary Institution
Newcastle-on-Tyne, Church of England Institute
,, Northern Union of Literary and Mechanics' Institutions

*Newhouse (near St. John's, Weardale), Library and News-room
*Newport (Monmouthshire), Athenæum and Mechanics' Institute
*Newport (Salop), Mechanics' Institute and Literary Society
New Swindon (Wilts), Mechanics' Institution
Northallerton, Institute
*Northampton, Religious and Useful Knowledge Society
North Devon, Associated Parochial Lending Libraries (care of Mr. Austen, Secretary, Castle-hill School, South Molton, Devon)
Norwich, Literary Institution
*Nottingham, Mechanics' Institution

Odiham, Mechanics' Institution
*Oldham, Lyceum
*Oxford, Public Library

*Patricroft (near Manchester), Mechanics' Institution
Pembroke Dock, Mechanics' Institute
*Pendleton (near Manchester), Mechanics' Institution
*Peterborough, Mechanics' Institution
*Plymouth, Mechanics' Institute
*Poole, Town and County Library and Literary Institute
Portaferry, Mechanics' Institute
Portsea, Watt Institute
*Portsmouth and Portsea, Literary and Philosophical Society
Prees (near Shrewsbury), Mutual Improvement Society
*Preston, Institution for the Diffusion of Knowledge
,, Literary and Philosophical Institution

*Radcliffe Bridge and Pilkington, Lyceum and Mutual Improvement Society
*Radway (near Banbury), Mechanics' Institution
*Reading, Literary, Scientific and Mechanics' Institution
*Redditch, Literary and Scientific Institute
Red Hill, Institute
*Reigate, Mechanics' Institution
Richmond (Surrey), Parochial Library and Reading Room
*Romford, Literary and Mechanics' Institution
*Royston, Institute
Ryde (Isle of Wight), Literary and Scientific Institute
Rye, Mechanics' Institution

*Saffron Walden, Literary and Scientific Institution
St. Austell, Literary Institution
*St. Ives (Cornwall), Institution
*St. Just (near Penzance), Institution
*St. Leonard's, Mechanics' Institution
Salford, Mechanics' Institution
,, Royal Borough Museum and Library
*Salisbury, Literary and Scientific Institution
*Saltash (Cornwall), Institute
*Sevenoaks, Literary and Scientific Institution
*Shaftesbury, Literary Institution
*Sheerness, Mechanics' Institution
*Sheffield, People's College
,, Free Public Library
*Shelton Potteries Mechanics' Institution (Staffordshire Potteries)
*Sherborne, Literary Institution
*Shiffnall, Mechanics' Institution
Shotley Bridge (Durham) Mechanics' Institution
*Shrewsbury, Shropshire Mechanics' Institution
*Sidmouth, Institution
Sleaford, Public Library
Slough, Mechanics' Institution
*Southam, Mutual Improvement Society
*Southampton, Polytechnic Institution
Stafford, Mechanics' Institution
*Staley-bridge, Mechanics' Institution
Stamford, Institution
*Stirling, School of Arts
*Stockton-on-Tees, Mechanics' Institute of Literature and Science
Stoke-upon-Trent, Athenæum
Stourbridge, Mechanics' Institution
*Stratford (Essex), Railway Mechanics' Institution and Literary Society
Stratton (near Swindon, Wilts), St. Margaret Library and Reading Room
Sudbury, Literary Institution and Museum
Swanage (Dorset), Literary and Scientific Institution
Swansea, Royal Institution of South Wales

Tamworth, Reading Room
*Tenterden, Mutual Improvement Society
*Thame, Institute
*Tiverton, Literary and Scientific Institution
Tottenham and Edmonton, Literary and Scientific Institution
*Trowbridge, Mechanics' Institution
*Tunbridge, Society of Literary and Scientific Enquirers
Tunbridge Wells, Useful Knowledge Institution

Uttoxeter, Literary and Scientific Institution

Ventnor and Bonchurch, Literary and Scientific Institution

*Wakefield, Mechanics' Institution
*Wandsworth, Literary and Scientific Institution
Ware, Institute
Wareham, Mutual Improvement Society
*Warminster, Athenæum
*Warrington, Mechanics' Institution
* ,, Museum and Library
*Warwick, Athenæum
Waterford, Mechanics' Institution
*Wednesbury, Mechanics' Institution
*Wellingborough, Mechanics' Institution
Wells, Literary and Scientific Institution
*Welshpool, Reading Society
Wenlock, Agricultural Reading Society
*West Bromwich, Institution for Advancement of Knowledge
Weston-super-Mare, Athenæum
*Whitehaven, Mechanics' Institution
Wilton (near Salisbury), Institute
*Winchester, Mechanics' Institution
,, Hants and Wilts Adult Education Society
*Windsor and Eton, Literary, Scientific and Mechanics' Institution
*Wirksworth, Mechanics' Institution
Wisbech, Mechanics' Institute
*Woburn, Literary and Scientific Institution
*Wolverhampton, Athenæum and Mechanics' Institute
Wordsley, Library and Reading Association
Worksop, Reading Society and Mechanics' Institution
Wrexham, Literary Institute
*Wrington (near Bristol), Literary Society

Yarmouth, Great, and Southtown, Young Man's Institute
* ,, Parochial Library and Museum
*Yeovil, Mutual Improvement Society
*York, Institute of Popular Science and Literature

ALSO

Bradford, Chamber of Commerce
Hull, Chamber of Commerce and Shipping
Liverpool, Chamber of Commerce

MEMORANDUM AS TO UNION OF COLONIAL INSTITUTIONS WITH THE SOCIETY OF ARTS, LONDON.

The Council having received an application from the Jamaica Society of Arts to be taken into Union, on the same footing as the Mechanics' Institutions of Great Briitain and Ireland, have had under consideration for some time past the means of most effectually extending the benefits of the principles of association and co-operation to similar Societies throughout the British Colonies and India. With this view they have laid down the following conditions and terms of Union :—

I.—The Society of Arts is prepared to receive into Union any Institution, established in a British Colony, or in the British Possessions in India, for the advancement of Literature and Science, or for the Encouragement of Arts, Manufactures, and Commerce.

II.—It shall be the duty of the Secretary of the Society of Arts to correspond with the Secretaries of such Associated Colonial Institutions, on matters relating to their recognised objects.

III.—The productions or manufactures of a Colony, transmitted by a Colonial Associated Institution, shall receive all due publicity, by means of the Society's Exhibitions, Publications, and Discussions.

IV.—The weekly *Journal* of the Society, with its other publications, shall be duly forwarded to every Associated Colonial Institution, and a portion of the columns of the *Journal* shall be reserved for Colonial Correspondence and Discussions.

V.—Whenever any member of an Associated Colonial Institution, bearing a letter of Introduction from its Secretary, shall visit London, he may enjoy the usual privileges of a Corresponding Member of the Society of Arts during his stay, and may have his letters addressed to him at the Society's house in the Adelphi.

VI.—The Council will afford their advice and assistance to any Colonial Associated Institution which may desire to obtain in England or France any scientific or educational apparatus, and will obtain and furnish to any Colonial Associated Institution reports on any produce sent over for examination.

VII.—A Colonial Associated Institution shall have the privilege of purchasing books through the Society's agency on the same scale of reduction as is now granted to Home Associated Institutions.

VIII.—The system of examination proposed to be instituted by the Society of Arts shall be extended so as to embrace candidates who shall have duly attended classes at Colonial Associated Institutions, and Certificates of Merit shall be awarded by the Society's examiners on examination papers duly authenticated and remitted from the Colonies.

IX.—A Colonial Institution may be admitted into Union on the same terms as a Home Institution, namely, an annual payment of two guineas.

LIST OF COLONIAL INSTITUTIONS IN UNION.

Jamaica, Royal Society of Arts
Fredericton (New Brunswick), Athenæum
Calcutta, Agricultural and Horticultural Society of India
Graham's Town (Cape of Good Hope), Literary, Scientific, and Medical Society
Kandy (Ceylon), Agricultural and Horticultural Society
Sydney, Mechanics' School of Arts
New South Wales, Horticultural Improvement Society
Hobart Town, Mechanics' Institute
British Guiana, Royal Agricultural Society
Grenada, Agricultural and Horticultural Society

W. TROUNCE, MACHINE AND GENERAL PRINTER, CURSITOR-STREET, CHANCERY-LANE, LONDON.

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